

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

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| <b>TITLE (PROVISIONAL)</b> | Are schoolteachers able to teach first aid to children younger than 6 years? A comparative study. |
| <b>AUTHORS</b>             | AMMIRATI, Christine; GAGNAYRE, Rémi; AMSALLEM, Carole; NEMITZ, Bernard; GIGNON, Maxime            |

### VERSION 1 - REVIEW

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| <b>REVIEWER</b>        | Jan Breckwoltd<br>University of Zurich, Switzerland<br>Charité - Medical University of Berlin, Germany |
| <b>REVIEW RETURNED</b> | 15-Jun-2014  |

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| <b>GENERAL COMMENTS</b> | <p>Thank you very much for giving the opportunity to review your manuscript "School teachers are able to teach first aid to children younger than 6 years: randomized study".</p> <p>Thank you very much for addressing this important question of the potential age for training in first aid. Questions as these are in fact crucial to develop health literacy in the lay population. However, I am sorry to say, that I'm unable to accept this submission for publication in 'BMJ Open'. My reasons cover two main areas, one in respect to the medical content, and the second in respect to scientific quality, which I would like to explain in the following.</p> <p>Starting with the medical content, to my opinion the background you draw on should be more critically reflected. The importance of first aid training is not sufficiently underpinned with evidence. You (more or less explicitly) excluded resuscitation from the program, although the only (still indirect) connection of first aid to patient safety is resuscitation. Accordingly, four of the five citations you gave as references to support first aid training ([1],[3-5]) are explicitly restricted to resuscitation. If resuscitation is excluded, evidence for first aid itself is very scarce, as is extensively discussed in the on-going ILCOR 2015 process. In addition, there is concern about adverse effects of training. E.g. recovery position performed by lays during cardiac arrest is often observed by EMS personnel on scene. In consequence, I think this issue needs to be discussed in your background section, or other reasons for first aid training should be elaborated on.</p> <p>Looking at content validity, I'm unsure, whether the presented photographs are fully appropriate to answer questions related to patient (or pupil) outcome. E.g. the fist picture might not require EMS (or might in turn even induce over-sending by EMS dispatch), as the boy might stand up in the next minute. Perhaps, the additional advice "the boy is unable to stand up after some time" would lead to</p> |
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|  | <p>a more realistic scenario. The scenario used by Bollig (reference [19]) for 6-7 year old children seems to be closer to reality. However, you did not elaborate on any differences (nor similarities) in your paper.</p> <p>At this point the issue of over-sending by EMS dispatch should be discussed as a potential adverse effect of the training. Since the evidence for non-resuscitation first aid is low, you should convincingly elaborate on its possible benefits in the background section.</p> <p>Finally I think, that it is not in line with many other experts to limit cardiac arrest training to high school (page 13, lines 17-19). [see Plant N, Resuscitation 2013]</p> <p><b>Scientific quality</b><br/> While your central scientific question is solid (transfer of knowledge and skills in pupils below 6 y), the answer to it is obvious and probably well established within the educational literature (“If you teach something in a meaningful way, it is likely to be recalled 1-3 months later”). Therefore, the novelty of your findings do not appear to be high, even more if taking into account that Bollig e.al already demonstrated the effect for 6-7 year olds [19].<br/> The effect of this training appears to be moderate if compared to the control group. The differences are attributable to the intervention (“taught” vs. “not taught”). However, you do not give an impression of the quantity of training throughout the paper. Therefore, it is impossible to estimate something like a dose-response relationship.</p> <p>My major concern however, is your control group. Although you included the phrase ‘randomized study’ into your topic, you did not deal with truly randomized groups. Apparently, as can be seen from your study flow chart, randomization was not performed before study set up (in a sense of ‘training’ vs. ‘no training’), but was done post hoc by the Ministry of Education. At this point of the study, you already introduced severe bias, as you stated in your manuscript p. 5, lines 45-48 (.... some children were trained ....., while others were not, because of....).</p> <p><b>Limitations</b><br/> A number of important limitations have not been addressed, most prominent the randomization process.<br/> In addition, it should have been referred to, that assessment of pupils’ performance by their own teachers could be a bias in favour of the trained group. Clearly, the kind of advice to alert SAMU (“....SAMU must be alerted, do it!”) will make a difference in performance. Also, you stated that “some teachers (of the control group) decided not to complete this assessment, which they considered time consuming and fastidious”.<br/> You partly discussed that the follow up was significantly worse in the control group (for the phone call scenario follow up was in fact only 42%, because your “intention-to-treat”-group consisted of 162 pupils (68/162 = 42%)). However, the follow up was also different for the photographs (91% vs. 86%).</p> <p><b>Conclusion</b><br/> For me, the first part of the conclusion is fine. However, starting at page 16, line 16, your statements are not any more supported by the</p> |
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|  | <p>data you presented in the manuscript. They should therefore be left out.</p> <p>Additional points, miscellaneous</p> <p>A number of additional points are given in the following (not being systematical, nor comprehensive).</p> <p>You introduce “nine criteria of assessment” in your abstract, which I did not find any more within the manuscript. Perhaps, they could be provided as additional material online.</p> <p>‘Strengths and limitations’ section<br/>I do not think, that the first sentence of your first bullet point may be regarded a strength, this would rather be ‘background’. The second sentence of the first bullet point and the whole second bullet point may be referred to as strengths. The third bullet point is not supported by the data you presented. The fourth bullet point is one limitation, but there are other, more severe limitations.</p> <p>The term ‘department’ is used in three different meanings throughout the text and might lead to confusion. Perhaps for one of the meanings ‘the region ‘Département Somme’ could be used?</p> <p>You could refer to the study flow chart in the text.</p> <p>Although I am no native speaker myself, I found a number of expressions in the text, which I would recommend to be revised by a native.</p> <p>References [21] and [22] already seem rather old (classical?), at least the second one stems from the pre-constructivist era. The concept of ‘situated learning’ [Lave &amp; Wenger, 1991] for example is not referred to.</p> <p>Page 7, lines 9-14, I don’t fully understand.</p> <p>The passage on page 13, lines 19-35 is not supported by the data you presented. From my point of view you might include it into the background section (in the sense of: „we have this program in France – however, it is unknown which contents could be delivered to children at what age – this is, why we conducted this study....)</p> <p>What is really new in relation to Bollig [19]?</p> <p>This is another paper you could have referred to, although it is in the scale of a “case report”:<br/>Bollig G, Myklebust AG, Østringen K. Effects of first aid training in the kindergarten--a pilot study. Scand J Trauma Resusc Emerg Med. 2011 Feb 28;19:13.<br/>OBJECTIVE: Children can be the only persons present in an emergency situation. Aim of the study was to evaluate the effects of a first aid course for 4-5-year-old kindergarten children given by a first aid instructor and kindergarten teachers.<br/>METHODS: A mixed methods approach using both quantitative and qualitative methods was used to investigate the effects of teaching first aid in the kindergarten in the present study. 10 kindergarten children at the age of 4-5 years were included in a pilot-study, 5 girls</p> |
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|  | <p>and 5 boys. Three of them were four years and seven were five years old. Two months after completion of the first aid course children were tested in a scenario where the children had to provide first aid to an unconscious victim after a cycle accident. The next seven months the children were followed by participant observation. RESULTS: The findings suggest that 4-5-year-old children are able to learn and apply basic first aid. Tested two months after course completion 70% of the children assessed consciousness correctly and knew the correct emergency telephone number; 60% showed correct assessment of breathing and 40% of the participants accomplished the other tasks (giving correct emergency call information, knowledge of correct recovery position, correct airway management) correctly. Many of the children showed their capabilities to do so in a first aid scenario although some participants showed fear of failure in the test scenario. In an informal group testing most of these children could perform first aid measures, too. Teaching first aid also lead to more active helping behaviour and increased empathy in the children. CONCLUSION: Kindergarten children aged 4-5 years can learn basic first aid. First aid training should start in the kindergarten.</p> |
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| <b>REVIEWER</b>        | Riccardo Lubrano<br>Sapienza Università di Roma Dipartimento di Pediatria |
| <b>REVIEW RETURNED</b> | 25-Jun-2014   |

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| <b>GENERAL COMMENTS</b> | might be appropriate to rewrite more clearly the methods of the abstract |
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| <b>REVIEWER</b>        | Georg Bollig<br>University of Bergen, Bergen, Norway<br>and<br>Department of Anesthesiology, Intensive Care, Palliative Medicine and Pain Therapy, HELIOS Klinikum Schleswig, Germany |
| <b>REVIEW RETURNED</b> | 25-Jun-2014   |

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| <b>GENERAL COMMENTS</b> | <p><b>Schoolteachers are able to teach first aid to children younger than 6 years: randomized study.</b></p> <p><i>Page 2, line 40-45 and page 4, line 54-57:</i></p> <p>Is a 6-hour training course considered enough to be able to both provide and teach first aid to children? If yes, this should be addressed in the discussion.</p> <p><i>Page 3, line 24-48:</i></p> <p>The "study was designed to assess the skills" – In my view the study does assess knowledge but not real first aid skills. Would it not be better to assess the acquired skills in a scenario? A scenario has</p> |
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e.g. been used in skill assessment in our studies cited as nr. 19 and in another study on first aid training in the kindergarten: Bollig G, Myklebyst AG, Østringen K. Effects of first aid training in the kindergarten – a pilot study. SJTREM 2011, 19:13. This should be discussed.

*Page 5, line 16-41:*

The curriculum seems to focus on trauma although many emergencies in western countries deal with acute emergencies in the field of internal medicine (heart attack, stroke, etc.)

*Page 7, line 14:*

It should be considered as bias that the pupils were tested by their own teachers.

*Page 12, line 23:*

A control group with only 48% of participants tested raises the question if the study really can claim to be a randomized study with a control group.

*Page 12, line 39-44:*

I do agree that testing with the use of role-play would be interesting. Why was it not done in the study?

*Page 13, 16-19:*

As my ideas on first aid and my propositions have been named I would like to make clear that they have been revised in later papers and book chapters:

1. Bollig G, Myklebyst AG, Østringen K. Effects of first aid training in the kindergarten – a pilot study. SJTREM 2011, 19:13
2. First Aid and the family. In: Craft-Rosenberg M, Pehler SR. Encyclopaedia of Family Health, SAGE Publications, Thousand Oaks 2011
3. First Aid Training in the Kindergarten: A Review of the Literature and Reflections from Practical Experience in Two Countries. NOVA Science Publishers New York 2013

So, if you want to refer to my ideas You should cite a newer source.

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|  | <p><b>Summary:</b></p> <p>An interesting study on teaching first aid to young children.</p> <p>I miss a discussion about the curriculum. Especially because of the fact that our study published in SJTREM in 2011 has shown that many 4-5 year old children can assess consciousness and breathing.</p> <p>The use of schoolteachers instead of first aid instructors is not discussed. It would be really interesting to investigate the difference between schoolteachers and first aid instructors as teachers.</p> |
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| <b>REVIEWER</b>        | Miranda Thurston<br>Hedmark University College, Norway |
| <b>REVIEW RETURNED</b> | 03-Jul-2014  |

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| <b>GENERAL COMMENTS</b> | <p>This paper addresses an interesting and potentially important subject, where there has been limited research to date. Conducting research such as that reported in this paper in the 'real-world' presents a number of challenges, however, which need to be more fully acknowledged and discussed than they have been (various sources of bias and how they may have influenced the results). The paper as it stands also needs to be reported in a much more scientifically robust way, including, in places, further detail about what was exactly done. This should start with a clearer articulation of the title of the paper, as well as a clearly formulated research question that should be presented in the introduction. In addition, there should be a much more careful description of the study design and sampling process used to recruit schools. The 'intervention' itself could be more clearly described and issues of 'fidelity' discussed. The latter process was particularly difficult to follow given the variation in the region in nurseries with trained and untrained teachers and the use of a process of randomization. The language used in places also made it difficult to follow explanations and lines of argumentation. Formatting of tables also needs to be improved. Some description of baseline characteristics of both groups would be beneficial (not just mean age) as well as some consideration of within and between group differences.</p> |
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## VERSION 1 – AUTHOR RESPONSE

All reviewers indicated that the method, as described in the abstract and in the title, was unclear and failed to clearly describe the study design. The abstract and title should more clearly describe the study design.

We have changed the title of the article and we have also extensively revised the abstract.

“Title: Are schoolteachers able to teach first aid to children younger than 6 years?”

Abstract:

**BACKGROUND.** Emergency medicine societies recommend teaching first aid at school. This study was designed to assess the knowledge acquired by very young children (< 6 years) trained by their own teachers at nursery school. This comparative study assessed the effect of training before the age of 6 years compared with a group of age-matched untrained children. **METHODS.** Some schoolteachers were trained by emergency medical teams to perform basic first aid. Eighteen classes comprising 315 pupils were randomly selected: nine classes of trained pupils (cohort C1) and nine classes of untrained pupils (cohort C2). The test involved observing and describing three pictures and using the phone to call the medical emergency centre. Assessment of each child was based on nine criteria, and was performed by the teacher 2 months after completion of first aid training.”

Jan Breckwoldt highlighted the important issue of the appropriate age for first aid training. Such questions are crucial to develop health literacy in the lay population.

We obviously agree with Jan Breckwoldt, which is why we wanted to work in collaboration with the Ministry of Education to take the children’s phases of psychomotor development into account.

Jan Breckwoldt’s comment: “the background we draw on should be more critically reflected. The importance of first aid training is not sufficiently underpinned with evidence. You (more or less explicitly) excluded resuscitation from the program, although the only (still indirect) connection of first aid to patient safety is resuscitation. Accordingly, four of the five citations you gave as references to support first aid training ([1],[3-5]) are explicitly restricted to resuscitation. If resuscitation is excluded, evidence for first aid itself is very scarce, as is extensively discussed in the on-going ILCOR 2015 process. In addition, there is concern about adverse effects of training. E.g. recovery position performed by lays during cardiac arrest is often observed by EMS personnel on scene. In consequence, I think this issue needs to be discussed in your background section, or other reasons for first aid training should be elaborated on.”

We have taken this remark into account and we have added a justification for the importance of first aid training in the Introduction section.

“In a medical emergency, it is essential for the first witness to raise the alert and provide emergency first aid as soon as possible. First aid has been defined as help given to any “sick or injured person until professional help arrives”. [1] The challenge of enabling everyone to provide life-saving first aid when faced with a medical emergency implies that everyone should be trained at some point in their life. The complexity of first aid training suggests that it should be started as early as possible in the educational curriculum. The public health goal is that every pupil should learn first aid, as laypersons play an important role in saving lives in emergency situations.”

We explicitly excluded resuscitation from the first aid training programme. The reviewer failed to understand this point because the previous version of the manuscript was not sufficiently clear. We have rewritten this part of the Introduction and justify exclusion of CPR from the programme by the

international literature that shows that young children do not have the physical capacity to perform effective chest compressions.

The following paragraph has been added to the Introduction:

“Children can provide first aid measures and save lives by recognizing life-threatening emergency situations and making an emergency call. [7] A young child may be the only person present in the event of an emergency and first aid education should therefore be started as early as feasible.

The age and weight of schoolchildren are significant factors determining the quality of cardiopulmonary resuscitation [8], as the depth of chest compression correlates with physical factors such as weight, Body Mass Index and height. [9] Abelairas-Gómez et al. showed that thirteen years was the minimum age at which children are able to achieve a minimum CPR quality similar to that achieved by adults. [10] Young children who are not yet physically able to compress the chest can nevertheless be taught how to perform appropriate first aid and can therefore be the first link of the Chain of Survival by calling for help. [11]”

The reviewer rightly questions whether the photographs are truly appropriate to answer questions related to patient (or pupil) outcome. We believe it is relevant to explain the reasons why we used photographs in the discussion section and we also discuss other methods that could have been used (simulation, video, serious games, etc.). As explained in the Methods section, the national education system required each pupil to be assessed by the child’s own teacher, as children of this age are not usually assessed, especially by an unknown adult not part of the classroom. For practical reasons, assessments were therefore performed by teachers in each classroom.

The following paragraphs have been added to the Discussion section:

“The child’s knowledge and ability to analyse a situation from photographs were assessed. This method was chosen for practical reasons, as the assessment was performed by the teacher in the classroom, although it may have been preferable to assess the acquired skills in a role play situation, as performed by several authors [24, 30] Another possibility would be to evaluate children in the context of a video or serious game”.

The reviewer pointed that the issue of over-sending by EMS dispatch should be discussed as a potential adverse effect of the training. In our health care system, the medical emergency number is unique. It centralizes all calls (medical advice, trauma, unconsciousness ...). Based on its evaluation, the medical regulator can give advice, send a GP, an ambulance or an emergency medicine team.

Jan Breckwoldt think, that it is not in line with many other experts to limit cardiac arrest training to high school (page 13, lines 17-19). [see Plant N, Resuscitation 2013]

Plant demonstrated that the depth of chest compression was correlated with physical factors and we have cited this paper. For this reason, CPR was excluded from our study, as young children are unable to perform CPR effectively. However, young children can call for help, which is crucial in the chain of survival.

We have explained our point of view in the Introduction:

“The age and weight of schoolchildren are significant factors determining the quality of cardiopulmonary resuscitation [8], as the depth of chest compression correlates with physical factors such as weight, Body Mass Index and height. [9] Abelairas-Gómez et al. showed that thirteen years was the minimum age at which children are able to achieve a minimum CPR quality similar to that achieved by adults. [10] Young children who are not yet physically able to compress the chest can nevertheless be taught how to perform appropriate first aid and can therefore be the first link of the Chain of Survival by calling for help. [11]”

Jan Brockport wrote that Bollig has already demonstrated the effect for 6- to 7-year-olds and



questioned the novelty of our findings. We would like to refine this point of view. The study by Bollig published in 2009 assessed whether a first aid teaching programme for 6- to 7-year-old children could influence their performance in a first aid scenario. In their study, first aid courses were given by first aid instructors. The aims of our study were to assess the knowledge and abilities of very young children trained in the nursery school by their own teacher. Teaching by the child's own teacher allows sustainable integration in the curriculum and widespread dissemination to achieve public health goals.

Most recently, Bollig published a new study evaluating the effects of a first aid course for 4- to 5-year-old kindergarten children provided by a first aid instructor and kindergarten teachers. This pilot study was performed on 10 kindergarten children.

A recent systematic review highlighted that no conclusions can be drawn concerning the most effective first-aid training courses or programmes or the age at which training can be most effectively provided. We agree with the findings of He et al., who stated that no conclusions can be drawn concerning which first-aid training courses or programmes are most effective or the age at which training can be most effectively provided.

To explain our choice and the scientific and pedagogical background, we have added the following paragraph to the Introduction:

“Published studies on emergency first aid training at school have focused on children aged 6 years or older, often trained by first aid instructors. [12-24] A recent systematic review highlighted the fact that no conclusions can be drawn concerning which first-aid training courses or programmes are most effective or the age at which training can be most effectively provided. [625] It is important to assess the effectiveness of standardised first-aid training as a basis for policy development and provision of first-aid training. More evidence is required to determine the most appropriate types of training according to the child's age, taking into account the child's psychomotor development and degree of autonomy.

Very limited scientific literature is available concerning children under the age of 6 years. Studies on emergency first aid training at school have focused on children often trained by first aid instructors, while few studies have assessed emergency first aid training at school provided by teachers themselves.

However, there are a number of arguments in favour of training provided by teachers, [26-29] as teachers know their pupils and their representations and can work on the basis of their previous knowledge and experience. Teachers are familiar with each child's sensitivity and can measure the emotional charge associated with emergency situations. The teacher establishes a relationship of trust with the child and can use situations experienced in the classroom as a pretext for learning and enhancing knowledge. The teacher is familiar with the required curriculum and skills. The teacher is a mentor, and the child is able to imitate the teacher's first aid skills

The aims of this preliminary study were to assess the knowledge and abilities of very young children trained in the nursery school by their own teacher and to compare the results with those of age-matched untrained children.”

The reviewer noted that we used the term "randomised study" in the title, although randomised were not actually constituted groups. We agree with this comment and have deleted the term "randomised study".

The reviewer wrote: “Apparently, as can be seen from your study flow chart, randomization was not performed before study set up (in a sense of ‘training’ vs. ‘no training’), but was done post hoc by the Ministry of Education. At this point of the study, you already introduced severe bias, as you stated in your manuscript p. 5, lines 45-48 (... some children were trained ....., while others were not, because of....).”

We have clarified the reasons for our procedure by adding the following paragraph to the Methods section:

“Due to the requirements of the national education system in nursery schools in this area, some children were trained by their teachers, while others were not, either because their teachers did not wish to train them or because they were not trained themselves.”

The reviewer noted that “a number of important limitations have not been addressed, most prominent the randomization process. In addition, it should have been referred to, that assessment of pupils’ performance by their own teachers could be a bias in favour of the trained group.” We agree. We have also added the following paragraph to the Discussion:

“This study has several limitations. Randomisation was not performed before setting up the study but was performed post hoc by the Ministry of Education, at their request for ethical reasons, as the Ministry of Education refused the idea of predefining two groups with and without first aid training. A consensus therefore had to be found to randomly select classes receiving and not receiving first aid training. Assessment of the children’s performance by their own teachers could constitute a bias in favour of the trained group. As explained in the Methods section, the national education system required each child to be assessed by his/her own teacher because children of this age are not usually assessed, especially by an unknown adult not part of the classroom. It would be interesting to investigate differences between schoolteacher and first aid instructor interventions during a limited training period, as teachers integrate specific skills into various subjects of the curriculum, depending on the learning pace of the class.

In addition, some teachers decided not to perform this assessment, which they considered to be “time-consuming and fastidious”. This study was conducted under “real life” conditions. Due to the importance of public health issues, we had to adapt our research methodology to the educational, legal and ethical requirements of the French national education system.”

Page 16, line 16, according to the reviewer, our statements are no longer supported by the data presented in the manuscript. We agree with this comment and have deleted this line.

The reviewer requested more details concerning the “nine criteria of assessment” mentioned in the abstract, but which he did not find in the body of the manuscript. This nine criteria were already described in the Methods section. We have added these criteria to Tables 1 &2 and we have also added the following sentences to clarify this point:

“Assessment of each child was based on nine criteria, and was performed by the teacher 2 months after completion of first aid training. These nine criteria consist of answers to the following questions. The following questions were asked in relation to each picture to test the pupil’s ability to observe, and decide whether or not to raise an alert.”

Jan Breckwoldt wrote:

‘Strengths and limitations’ section

I do not think, that the first sentence of your first bullet point may be regarded a strength, this would rather be ‘background’. The second sentence of the first bullet point and the whole second bullet point may be referred to as strengths. The third bullet point is not supported by the data you presented. The fourth bullet point is one limitation, but there are other, more severe limitations.

We have followed the reviewer’s advice and we have deleted the first sentence of our first bullet point. The third bullet point is not supported by the data of our study and has therefore been deleted. We have added a bullet point indicating the more serious limitations described by the reviewer:

“♣ As required by the national education system, randomisation was performed post hoc by the Ministry of Education and assessment of the children’s performance was performed by their own

teachers.”

The term ‘department’ is used in three different meanings throughout the text and might lead to confusion. Perhaps for one of the meanings ‘the region ‘Département Somme’ could be used?

We agree with this comment and the use of this term has been clarified.

As recommended by the reviewer, we refer to the flow chart in the text:

“Eighteen classes comprising 315 pupils were randomly selected: nine classes of trained pupils and nine classes of untrained pupils (Figure 1).”

The reviewer found a number of expressions in the text that need to be revised by a native English speaker. A native English speaker has therefore reviewed the revised manuscript.

References [21] and [22] already seem rather old (classical?), at least the second one stems from the pre-constructivist era. The concept of ‘situated learning’ [Lave & Wenger, 1991] for example is not referred to.

Yes, this is an old but classical reference. The concept of ‘situated learning’ is also classical. We have cited this reference and added the following sentence:

“Finally, the teachers’ active part in “role-playing games”, placing the child in a situation for which he/she is responsible for somebody else’s health, appears to be a more efficient method to acquire complex skills, according to the concept of situated learning. [31]”

Page 7, lines 9-14 was unclear. We have tried to clarify this paragraph as follows:

“The national education system required that each child to be assessed by his/her own teacher because children of this age are not usually assessed, especially by an unknown adult not part of the classroom. In order to obtain the most objective results possible, written instructions were given and individually discussed with each teacher approximately 2 months after completion of first aid training.”

The passage on page 13, lines 19-35 is not supported by the data presented. According to the reviewer, this paragraph could be included in the background section.

We agree with the reviewer. We have inserted this paragraph at the beginning of the Introduction:

“In France, all trainee schoolteachers must learn basic first aid to be applied in the classroom and to be taught to their pupils. More than 9,875,000 school children ranging from 4-year-old nursery schoolchildren to end of secondary school teenagers, about 14 to 15 years of age, should receive this first aid training. This programme is called “apprendre à porter secours” (“learn how to help”) and pupils can obtain a “basic-life saving diploma” at the end of secondary school.”

The reviewer asked us what is really new compared to the study by Bollig [19] and suggested we refer to another paper: Bollig G, Myklebust AG, Østringen K. Effects of first aid training in the kindergarten--a pilot study. *Scand J Trauma Resusc Emerg Med.* 2011 Feb 28;19:13.

We have already answered the first question and we have now cited the suggested paper, as requested.

Reviewer 2: Riccardo Lubrano

The reviewer suggests that it might be appropriate to more clearly describe the methods in the abstract.

We agree with this comment and have modified the abstract as follows:

“METHODS. Some schoolteachers were trained by emergency medical teams to perform basic first aid. Eighteen classes comprising 315 pupils were randomly selected: nine classes of trained pupils (cohort C1) and nine classes of untrained pupils (cohort C2). The test involved observing and describing three pictures and use of the phone to call the medical emergency centre. Assessment of each child was based on nine criteria, and was performed by the teacher 2 months after completion of first aid training.”

Reviewer 3: Georg Bollig

Page 2, line 40-45 and page 4, line 54-57:

Is a 6-hour training course considered enough to be able to both provide and teach first aid to children? If yes, this should be addressed in the discussion.

Yes, we think a 6-hour training course can be considered to be sufficient. We have added the following details to the Methods section:

“Teachers received first aid training to improve their prior knowledge and then worked on educational applications in the context of nursery schools. This training was conducted by emergency medical teams and education specialists, assisted by Ministry of Education health professionals”

We have also added the following paragraph to the Discussion:

“Teacher training lasted 6 hours. Our experience and an unpublished evaluation suggest that a 6-hour training course is sufficient. Teachers have satisfactory prior first aid knowledge and are trained in science education. This 6-hour training upgraded their knowledge and helped them to integrate first aid training in the curriculum. The effectiveness of this training needs to be evaluated and further studies are required to define the optimal design.”

Page 3, line 24-48:

The “study was designed to assess the skills” – In my view the study does assess knowledge but not real first aid skills. Would it not be better to assess the acquired skills in a scenario? A scenario has e.g. been used in skill assessment in our studies cited as nr. 19 and in another study on first aid training in the kindergarten: Bollig G, Myklebyst AG, Østringen K. Effects of first aid training in the kindergarten – a pilot study. SJTREM 2011, 19:13. This should be discussed.

We agree with the reviewer. Our study assessed knowledge but not real first aid skills. Children were asked to analyse a situation from photographs. Due to the constraints imposed by the national education system, it was decided, for practical reasons, that this assessment would be performed by the teacher in each classroom.

The following paragraph has therefore been added to the Discussion:

“The child’s knowledge and ability to analyse a situation from photographs were analysed. For practical reasons, this assessment was performed by the teacher in each classroom, although it may have been preferable to assess the acquired skills in a role play situation, as performed by several authors.

[24, 30] Another possibility would be to evaluate children in the context of a video or serious game.”

Page 5, line 16-41:

The curriculum seems to focus on trauma although many emergencies in western countries deal with acute emergencies in the field of internal medicine (heart attack, stroke, etc.)

As indicated in the Methods section, the curriculum does not focus on trauma, but we agree that the assessment process focused on trauma.

This point has been discussed in the Discussion:

“The situations described in the pictures concerned trauma, although many emergencies in western countries deal with acute emergencies in the field of internal medicine (heart attack, stroke, etc.)” but, education experts from the Ministry of Education thought that it would be too emotionally disturbing for a young child to be faced with an adult in a life-threatening situation and therefore proposed that young children should act out situations involving injured children.”

Page 7, line 14:

It should be considered as bias that the pupils were tested by their own teachers.

Yes, we agree, this can be considered to be a source of bias. As explained above, the national education system stipulated a number of requirements, including assessment of the children by their own teachers.

The following paragraph has been added to the Discussion:

“Assessment of the children’s performance by their own teachers could constitute a bias in favour of the trained group. As explained in the Methods section, the national education system required each child to be assessed by his/her own teacher because children of this age are not usually assessed, especially by an unknown adult not part of the classroom. It would be interesting to investigate differences between schoolteacher and first aid instructor interventions during a limited training period, as teachers integrate specific skills into various subjects of the curriculum, depending on the learning pace of the class.”

The Introduction now indicates:

“The national education system required each pupil to be assessed by his/her own teacher because children of this age are not usually assessed, especially by an unknown adult not part of the classroom.”

Page 12, line 23:

A control group with only 48% of participants tested raises the question if the study really can claim to be a randomized study with a control group.

We agree that the term “randomised” was inappropriate. This point is now discussed in the Discussion:

“This study has several limitations. Randomisation was not performed before setting up the study, but was performed post hoc by the Ministry of Education at their request, for reasons, as the Ministry of Education refused the idea of predefining two groups with and without first aid training.. A consensus therefore had to be found to randomly select classes receiving and not receiving first aid training.”

Page 12, line 39-44:

I do agree that testing with the use of role-play would be interesting. Why was it not done in the study?

This study had to comply with the requirements of the national education system. Unfortunately, simulation could not be performed in this context. We hope that role play situations will be able to be used for future studies.

“The child’s knowledge and ability to analyse a situation from photographs were analysed. For practical reasons, assessments were therefore performed by teachers in each classroom, although it may have been preferable to assess the acquired skills in a role play situation, as performed by several authors [24, 30]”

Page 13, 16-19:

As my ideas on first aid and my propositions have been named I would like to make clear that they have been revised in later papers and book chapters:

1. Bollig G, Myklebyst AG, Østringen K. Effects of first aid training in the kindergarten – a pilot study. SJTREM 2011, 19:13
2. First Aid and the family. In: Craft-Rosenberg M, Pehler SR. Encyclopaedia of Family Health, SAGE Publications, Thousand Oaks 2011
3. First Aid Training in the Kindergarten: A Review of the Literature and Reflections from Practical Experience in Two Countries. NOVA Science Publishers New York 2013

So, if you want to refer to my ideas You should cite a newer source.

We obviously want to refer to one of the authors who has worked extensively on this subject. We have read several books that were not previously available and have therefore cited these three references.

Reviewer 4: Miranda Thurston

## INTRODUCTION

Miranda Thurston asked us to clearly formulate the research question that should be presented in the introduction. We have added the following paragraph at the beginning of the Introduction to help the reader more clearly understand the research question.

“The challenge of enabling everyone to provide life-saving first aid when faced with a medical emergency implies that everyone should be trained at some point in their life. The construction of knowledge and skills that can be easily mobilized in a medical emergency situation suggests that this training should be started as early as possible in the educational curriculum. The public health goal is that every pupil should learn first aid, as laypersons play an important role in saving lives in emergency situations.”

We have clarified this paragraph of the Introduction:

“Many experts now recommend training children starting at primary school to ensure that these skills are deeply and permanently ingrained. Emergency medicine societies recommend teaching first aid at school so that every citizen knows how to perform first aid appropriately and raise emergency alerts at the earliest possible time. [1-5] Published studies on emergency first aid training at school have focused on children aged 6 years or older, often trained by first aid instructors. [6-18] A recent systematic review highlighted that no conclusions can be drawn concerning the most effective first-aid training courses or programmes or the age at which training can be most effectively provided. [19]”

To clarify the research question, we have added a paragraph concerning the child’s age and a paragraph on the issue of emergency first aid training at school provided by teachers themselves. We have also added a reference.

“It is important to assess the effectiveness of standardised first-aid training as a basis for policy development and provision of first-aid training. More evidence is required to determine the most appropriate types of training according to the child’s age, taking into account the child’s psychomotor development and degree of autonomy. Very limited scientific literature is available concerning children under the age of 6 years. Studies on emergency first aid training at school have focused on children

often trained by first aid instructors, while few studies have assessed emergency first aid training at school provided by teachers themselves.

However, there are a number arguments in favour of training provided by teachers, [20] as they know their pupils and their representations and can work on the basis of their previous knowledge and experience. Teachers are familiar with each child’s sensitivity and can measure the emotional charge associated with emergency situations. The teacher establishes a relationship of trust with the child and can use situations experienced in the classroom as a pretext for learning and enhancing knowledge. The teacher is familiar with the required curriculum and skills. The teacher is a mentor, and the child is able to imitate the teacher’s first aid skills.”

For greater clarity, we have formulated the study objective at the end of the Introduction as follows:

“The aims of this preliminary study were to assess the abilities of very young children trained in the nursery by their own teacher and to compare the results with those of age-matched untrained children.”

The following sentence, initially placed at the end of the introduction, has now been placed at the beginning of the Methods section.

“This study, carried out in the Somme department (560,000 inhabitants), was supervised by the University Hospital emergency medicine department, national education teachers, and a University research unit specialised in health education.”

Miranda Thurston: “Formatting of tables also needs to be improved.”

We have revised the format of our tables to make them as clear as possible. We hope that these changes are sufficient.

We hope that, in the light of our explanations and the many changes that we have made, this paper will now be considered suitable for publication.

#### VERSION 2 – REVIEW

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| <b>REVIEWER</b>        | Jan Breckwoldt<br>University of Zurich, Switzerland<br>Medical University of Berlin, Germany |
| <b>REVIEW RETURNED</b> | 09-Aug-2014  |

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| <b>GENERAL COMMENTS</b> | <p>In my eyes, many issues have been addressed, however I still find some important questions to be open.</p> <p>As a first point, I probably did not explain well enough what I meant by referring to the evidence base of <i>first aid</i>. Up to now there is no proof of positive effects of first aid measures on patient outcome , except from Basic Life Support. I think, this is important to mention, if we want to approach the issue in a scientific way. If we design extensive first aid programmes, we should know about the specific effects of its elements. As mentioned in my first review, there might also be adverse effects. Therefore I feel, that you should open the perspective of first aid training to CPR as an evidence based aim of respective programmes.</p> <p>From my point of view it is no problem, that you do not include CPR/cardiac arrest into your curriculum at the age of &lt; 6 years. However, one important obstacle to perform bystander CPR is the attitude towards helping. This is a fundamental problem in the general population which could be (and is) addressed by first aid</p> |
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|  | <p>training at early childhood. Nota bene: in the manuscript you still refer to 5 publications from the resuscitation field [2-6] to underpin the importance of first aid training.</p> <p>This issue should be part of the introduction (or the discussion). In this context you rose the controversy of the age where to start CPR training and you questioned the “thought” of Jan Brockport/Breckwoldt that it would not be in line with many other experts to limit cardiac arrest training to high school. I would support your position if you restricted the statement to serious chest compression training. However, the educational concept is rather that of a continuum, where many elements of cardiac arrest should already be addressed earlier. By the way: that children reach compression depths comparable to adults not before the age of 13, is only found by Abelairas-Gómez. Drawing on some papers you also cite: Jones (BMJ 2007) says that children are capable at 11-12 years of age; Bohn (Resuscitation 2012): capable at 10 years; Fleischhackl (Crit Care 2009): capable at 9 years. Feasibility of CPR <b>teaching</b> including AED has been demonstrated in 6-7 year old children (Uray, Resuscitation 2003).</p> |
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| <b>REVIEWER</b>        | <p>Georg Bollig</p> <p>Department of Clinical Medicine, University of Bergen, Norway</p> <p>and</p> <p>Department of Anesthesiology, Intensive Care, Palliative Medicine and Pain Therapy, HELIOS Klinikum Schleswig, Germany</p> |
| <b>REVIEW RETURNED</b> | 19-Aug-2014   |

- The reviewer completed the checklist but made no further comments.

### VERSION 2 – AUTHOR RESPONSE

The reviewer wrote:

As a first point, I probably did not explain well enough what I meant by referring to the evidence base of first aid. Up to now there is no proof of positive effects of first aid measures on patient outcome, except from Basic Life Support. I think, this is important to mention, if we want to approach the issue in a scientific way. If we design extensive first aid programmes, we should know about the specific effects of its elements. As mentioned in my first review, there might also be adverse effects.

Therefore I feel that you should open the perspective of first aid training to CPR as evidence based aim of respective programmes.

From my point of view it is no problem, that you do not include CPR/cardiac arrest into your curriculum at the age of < 6 years. However, one important obstacle to perform bystander CPR is the attitude towards helping. This is a fundamental problem in the general population which could be (and is) addressed by first aid training at early childhood. Nota bene: in the manuscript you still refer to 5 publications from the resuscitation field [2-6] to underpin the importance of first aid training.

This issue should be part of the introduction (or the discussion).

We agree. So we added the following paragraph in the introduction section: “Although up to now there is no proof of positive effects of first aid measures on patient outcome, except from Basic Life Support. In addition, there could concern about adverse effects of training, like recovery position performed by lays during cardiac arrest. However, one important obstacle to perform bystander CPR is the attitude towards helping. This is a fundamental problem in the general population which could



be addressed by first aid training at early childhood.”

The reviewer pointed the controversy of the age where to start CPR training and that do not justify to withhold CPR training from younger children.

We agree and we moderate our comments on this issue by adding the following paragraph:

“However, determining an age is controversial. [8-11] This results do not justify to withhold CPR training from younger children. Children who underwent training in younger years significantly improved their performance after 3-4 years. [9, 11, 12]” We also added this following reference:

♣ Bohn A, Van Aken HK, Möllhoff T, et al. Teaching resuscitation in schools: annual tuition by trained teachers is effective starting at age 10. A four-year prospective cohort study. *Resuscitation*. 2012 May;83(5):619-25. doi: 10.1016/j.resuscitation.2012.01.020.

♣ Bohn A, Van Aken H, Lukas RP, et al. Schoolchildren as lifesavers in Europe – Training in cardiopulmonary resuscitation for children, *Best Pract Res Clin Anaesthesiol* 2013;27:387-96.

The reviewer pointed that “high school” is not a precise description (p17).

We agree. As suggested, we replaced “high school” by “until an age of 10 years”. So, we wrote the following sentence “Cardiac arrest was not addressed until an age of 10 years in line with Bollig’s propositions. [20, 31-32]”

The reviewer highlighted that some parts of the manuscript now became a bit lengthy.

As suggested by the reviewer, we reduced this part.

1/ Introduction, at the end of the first paragraph, we deleted four sentences. We propose now : “The construction of knowledge and skills can be easily mobilized in a medical emergency situation. Many experts and Emergency medicine societies recommend teaching first aid at school so that every citizen knows how to perform first aid appropriately and raise emergency alerts at the earliest possible time. [2-6] Children can provide first aid measures and save lives by recognizing life-threatening emergency situations and by making an emergency call. [7]”

2/ Discussion, sub-title “Observation capacity”: we deleted the following sentences : “A significant difference was observed between the two cohorts, reflecting the existence of cognitive links between the test situations.” And “It is difficult to define this aspect from these results alone”

3/ Discussion, sub-title “Ability to raise the alert”: we deleted the following sentence: “This difference between intention and ability to act shows that learning methods must be based on real-life situations and must be regularly revised.”

4/ Discussion, sub-title “Limitations”. As suggested, we deleted several sentences. We propose now : “Limitations

This study has several limitations. As stated in the methods section, randomisation was not performed before setting up the study for ethical reasons, as the Ministry of Education refused the idea of predefining two groups with and without first aid training. Assessment of the children’s performance by their own teachers could constitute a bias in favour of the trained group. As explained in the Methods section, each child were assessed by his/her own teacher.”

We also deleted this sentences :

“A size difference was also observed between the two cohorts for the last exercise.”

“For practical reasons, as this assessment was performed...”

The reviewer pointed the possibility that first aid training might induce over-sending of EMS.

We agree and we added the following sentence in the discussion section : “This indicates that pupils are able to distinguish according to severity, and that the induction over-sending is less likely.”

Concerning the “main bias”, as suggested by the reviewer, we added : “This bias favours the trained group. The follow-up-rates differ markedly between trained and untrained children (for photographs 91.5% vs. 86.4%, and for the phone call 91.5% vs. 42.0%). This reduces the strength of our results.”

The reviewer wrote: “P.16, lines 47-50: It is unclear what you mean by “A size difference was also observed...”. Did you address the same point as in lines 27-30 ? If so, this could be pulled together.”  
Yes. We did as suggested.

The reviewer highlighted that references [12-17] (publication dates: 1973-1989) deal with outdated CPR concepts.

We agree and we deleted them. The bibliography has been renumbered.

We hope that, in the light of our explanations and the changes that we have made, this paper will now be considered suitable for publication.