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Successful e-learning programme on the detection of child abuse in Emergency Departments: a randomised controlled trial

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ABSTRACT

Objective To evaluate the effectiveness of an electronic learning (e-learning) programme on the performance of nurses in the recognition of child abuse in a simulated case in the Emergency Department (ED).
Design Blinded, randomised controlled trial using pre- and postintervention design.
Setting The ED of a University Medical Center in the Netherlands.
Participants 38 ED nurses were included, 25 nurses were analysed.
Intervention Half of the participants followed a 2-h e-learning programme focused on the recognition of child abuse, the others acted as a control group.
Main outcome measurements Individual performance during a case-simulated parent interview to detect child abuse and self-reported self-efficacy for the detection of child abuse. Performance on the simulation was scored by an expert panel using a standardised assessment form which was designed to score quantity and quality of the questions posed by the nurse (minimum score 0; maximum score 114).
Results During post-test, nurses in the intervention group performed significantly better during the simulation than the control group, (89 vs 71, 95% CI 2.9 to 33.3), and reported higher self-efficacy (502 vs 447, 95% CI −25.4 to 134.7). Performance in detecting child abuse correlated positively with the self-efficacy score (Spearman correlation 0.387, p value 0.056). Comparing post- and pretest results separately for the intervention and the control group showed a significant increase in performance in the intervention group.
Conclusion E-learning improved the performance in case simulations and the self-efficacy of the nurses in the ED in the detection of child abuse. Wider implementation of the e-learning programme to improve the first step in the detection of child abuse is recommended.
Trial registration Protocol registration system of clinicaltrials.gov: NCT00844571

INTRODUCTION

The discrepancy between child abuse officially recognised by child protection services and the prevalence of abuse based on self-reports of children in community surveys indicates that there are frequent failures in the recognition of child abuse.[1–4] In the Netherlands, hospitals contribute to only 6% of all reports to child-protection services, while international data indicate that 8% of reports come from hospitals.[3 5] One of the screening instruments used to ensure that child abuse is

What is already known on this topic

► There are frequent failures in the recognition of child abuse and a diagnostic tool used to ensure that child abuse is considered in the Emergency Department (ED) is a compulsory checklist applied to any child attending the ED with injury.
► The presence of ED staff with knowledge, skills and attitude is a core component in the recognition of child abuse: educational programmes have been designed to improve this.

What this study adds

► This study evaluates the change in performance in case simulations and in self-reported self-efficacy after an e-learning programme in the area of child abuse.
► Moreover, this educational programme has been evaluated by using a randomised controlled methodology: with an investment of 2 h e-learning, performance in a simulated case regarding the recognition of child abuse was measurably improved in nurses working in an Emergency Department.

considered in the Emergency Department (ED) of a hospital is a checklist for all children attending the department. In the Netherlands, a child abuse checklist called SPUTOVAMO has been widely introduced in EDs. SPUTOVAMO is an acronym composed of the first letters of nine questions regarding the injury. This checklist, originally developed by Compernolle[6] in 1996, was revised in a checklist with six questions with binary answer possibilities (SPUTOVAMO-R) pointing unambiguously at the suspicion of child abuse or not. This SPUTOVAMO-R is quite similar to the detection instrument of Benger and Pearce and it contains questions designed to explore the initial injury/complaint, the consistency of the history, delay in presentation, top/toe examination, previous injuries and the interaction of the parents and the child (see figure 1).[7]

ED professionals complete the screening instrument and the result of this first step in the process of recognition of child abuse will predominantly
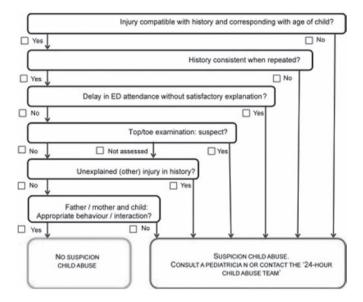
Figure 1 SPUTOVAMO-R, a checklist with six questions with binary answer possibilities.

determine the consecutive work-up for the potentially mal-treated child. The presence of ED staff with the necessary knowledge, skills and attitudes is therefore a key component in the recognition of child abuse.[8] Educational programmes have been designed to improve clinical performance by improving knowledge and skills and by changing attitudes.[9] Interventions such as the introduction of flowcharts and web-based training programmes positively influence knowledge of, and attitudes to the recognition of child abuse.[7] [10] An active learning environment which has received increasing attention is electronic learning (e-learning) and includes applications and processes such as web-based and computer-based teaching.[11] [12] E-learning promotes self-directed learning, reduces the required learning time and offers time-flexibility for the learners. Studies show that e-learning programmes for nurses can be at least as effective as face-to-face teaching.[11–13] In a setting at an ED with irregular working schedules for professionals, an innovative educational intervention such as e-learning may be an effective method.[14]

Self-efficacy is another important aspect of learning and is defined by Bandura as 'a person's belief in their capabilities to organize and execute the course of action required to produce given attainments'.[15] The higher a person's self-efficacy in respect of a particular task the more likely they are to perform it.

A change in the performance in the recognition of child abuse after an educational intervention, as a measurement of the integration of knowledge and attitude, has never been reported.[3] [4] [16] [17] Only one educational programme has been evaluated using a randomised controlled design, with documentation of child abuse as an outcome measure.[14] This educational programme did not lead to improved documentation regarding physical child abuse in the ED setting.

Our study was performed in an ED of a University Hospital in the Netherlands. The ED has a paediatric unit with an annual attendance of 4000 patients under the age of 18 years. SPUTOVAMO-R is filled out for all patients under the age of 18 years attending the ED (this is a compulsory field in the electronic file of the medical records of a patient under the age of 18 years). Suspicion of child abuse is present in 2.8%, with a higher percentage in the younger age group (3.7% under the

age of 7). A suspicion of child abuse by the nurse (positively screened SPUTOVAMO-R) is followed by a systematic work-up for possible child abuse starting with a paediatric consultation in the ED. After the work-up, all screened positive cases are discussed in the multidisciplinary Child Abuse Team in the presence of the Child Protection Services.

The aim of our study was to evaluate the effectiveness of an e-learning programme in the recognition of child abuse in terms of the effect on both the performance during a case-simulation and on self-efficacy in a randomised controlled trial. Verification of the efficacy of this programme would support the wider use of e-learning programmes to improve the first step in the recognition of child abuse.

PATIENTS AND METHODS
Study design and timetable
A randomised controlled trial was performed using a pre- and postintervention design. The pretest was conducted in all participants from August to October 2008. The post-test was performed in the control group in April 2009, 2 weeks before the launching of the intervention programme, and in the intervention group 2 weeks after the launching of the programme. The trial had to be finished before May 2009, after which the trial would be confounded as all ED nurses were then scheduled to receive additional training in the recognition of child abuse following a directive of the Dutch Health Care Inspectorate.

Intervention
The intervention was an e-learning programme on child abuse known as The Next Page developed by the non-profit Augeo foundation (http://www.thenextpage.nl). The programme consists of three different modules, recognition, acting and communication. Our study focuses only on the first of these modules which was specifically developed to improve recognition of child abuse by nurses in the ED. The e-learning programme contains simulations of clinical cases, video animations and interactive elements. Participants were instructed to complete the programme in a minimum of 2 h during a 2-week period either at the hospital or at home. Participants were allowed to access the e-learning programme more often than the obliged 2 h after they obtained access.

Participants and randomisation
The study was carried out among nurses at the ED of the University Medical Center Utrecht, the Netherlands. Utrecht is one of the largest cities in the Netherlands with 300 000 inhabitants. Thirty-eight nurses had a permanent contract in the department during the study period and were included in the study. During randomisation, participants were allocated to an intervention or a control group using a computer-generated randomisation list created by an independent statistician. Owing to the nature of the trial it was not possible to blind the participants and the head researcher to randomisation.

Outcome measures
In all participants (intervention and control) performance in simulated cases was measured as the primary outcome and self-efficacy as the secondary outcome. Outcome measures were determined at baseline (pretest) and after the intervention group had been trained (post-test). An expert panel of three paediatricians experienced in the recognition of child abuse, who were blinded to the allocation, evaluated the recorded

Table 1 Baseline characteristics of study participants

	Intervention group (n = 19)	Control group (n = 19)	p Value (95% CI)
Female (n)	15	15	
Mean age (years)	41 (9)	41 (11)	0.961 (−6.4 to 6.7)
Mean work experience (years)	9 (9)	9 (9)	0.753 (−4.3 to 5.8)
Mean VAS pretest self-efficacy score (0−800)	395 (92)	403 (144)	0.847 (−72.2 to 87.4)
Mean pretest performance score (0−114)	74 (18)	66 (25)	0.280 (−22.0 to 6.6)
Duration of the case simulation (s)	544 (152)	534 (143)	0.842 (−87.4 to 106.7)

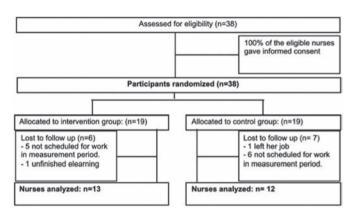Values are means (SD) unless stated otherwise.

Figure 2 Flow of the participants through the trial and reasons for loss to follow-up.

performance. Baseline characteristics of the randomised participants were collected and are presented in table 1. Figure 2 shows the flow of participants through the trial and reasons for loss to follow-up.

Primary outcome measurement: performance in simulated cases

We designed eight simulated cases—based on real clinical cases and ranging in age from 9 month to 5 years—attending the ED for injuries such as bruises, fractures and unconsciousness with varying histories (fall from stairs, fall from a height, unknown event). The top/toe examination was simulated by showing pictures of the undressed child when the nurse announced the necessity of this examination.

During both the pre- and the post-test participants were tested with one case simulation, and were asked to obtain all information necessary to complete SPUTOVAMO-R (figure 1). For each case simulation all items of the six-point checklist had to be scored. The final conclusion of the participant on the suspicion of child abuse and duration of each interview were also recorded. The injury in the case simulation was more often inflicted than accidental (proportion 2:1). The primary researcher (AEFNS) listed the case simulations which were applied during the pretest to avoid repeating these in the post-test. Three persons took part in the simulation test: the study participant, a scenario leader and an actor in the role of the parent with a doll to represent the patient. After each case simulation, the participants received immediate structured feedback from the scenario leader.[18]

The case-simulations were recorded on video and, after the completion of pre- and post-test, the blinded expert panel scored the performance using a standardised assessment form which was designed to score quantity and quality of the questions posed by the nurse (minimum score 0; maximum score 114). One to three questions per item of the six-point checklist had to be asked to be able to make the decision for that item.

Secondary outcome measurement: self-efficacy

Self-efficacy in respect of the detection of child abuse was evaluated using a 100 mm, visual analogue scale (VAS) with anchor bars, consisting of eight statements such as: 'Indicate to what extent you feel able to determine the consistency of the given history'. These statements correspond to the items of the checklist on child abuse. For each individual a total self-efficacy score was calculated by summing the eight individual VAS scores (total VAS score, min. 0 mm, max. 800 mm).[19] Self-efficacy was measured in all participants immediately before the simulation test.

Statistical analysis

Distribution was judged on the basis of graphical representation of the data. Student t test was used for apparently normally distributed data. Other data were analysed using non-parametric tests, to assess differences between the groups. An inter-rater reliability analysis using the intraclass correlation coefficient was performed to determine consistency among the members of the expert panel. The collected data were analysed using SPSS version 17.0 for Windows. We considered a p value of ≤0.05 to be statistically significant.

To account for loss to follow-up, both an intention to treat analysis with the pretest score carried forward and a multiple imputation analysis were performed. As the results were not essentially altered by these analyses we decided to present the analysis of the participants who performed the post-test.

Role of the funding source

The study was partly funded by the Augeo Foundation. The funders had no part in the design of the study; collection, analysis and interpretation of the data; the writing of the report; or the decision to submit the article for publication.

RESULTS
Subjects

No significant differences in nurses' characteristics were seen between the control and the intervention group (table 1). Comparing the lost to follow-up and the analysed participants, no differences were seen at baseline (table 2).

Effect of intervention
Performance during case simulations

Complete data were available for 25 nurses: 12 nurses in the control group and 13 in the intervention group. The total performance during post-test of the intervention group was significantly better than that in the control group, indicating that more adequate questions were asked resulting in a higher quality of history taking (p value 0.022). Analysis per item of the six-point checklist and duration of the test is shown in

Original article

Table 2 Baseline characteristics of analysed participants and participants that were lost to follow-up

	Analysed participants (n = 25)	Lost to follow-up (n = 13)	p Value (95% CI)
Female (n)	18	12	
Mean age (years)	42 (9)	39 (12)	0.451 (−4.3 to 9.4)
Mean work experience (years)	9 (7)	9 (9)	0.977 (−5.4 to 5.2)
Mean VAS pretest self-efficacy score (0–800)	384 (111)	429 (132)	0.273 (−127.4 to 37.1)
Mean pretest performance score (0–114)	71 (21)	67 (24)	0.559 (−10.8 to 19.7)
Duration of the case-simulation (s)	546 (160)	536 (141)	0.841 (−112.4 to 92.1)

Values are means (SD) unless stated otherwise.

Table 3 Participants' mean scores (SD) on adequate questions regarding possible child abuse during case simulations and the VAS total self-efficacy score (n = 25)

	Intervention group (n = 13)	Control group (n = 12)	p Value (95% CI)
Evaluate injury in the context of the explained history (range 0–24)	18 (6)	15 (4)	0.127 (−0.9 to 6.9)
Evaluate consistency of the history (range 0–18)	14 (4)	9 (5)	0.013*
Evaluate if there is a delay in presentation (range 0–24)	20 (5)	18 (5)	0.359 (−2.2 to 5.9)
Evaluate the physical examination (range 0–18)	17 (1)	14 (5)	0.056*
Evaluate history of past injuries (range 0–18)	13 (5)	8 (6)	0.053*
Evaluate interaction parent–child (range 0–12)	7 (4)	6 (4)	0.763*
Total performance score (range 0–114)	89 (19)	71 (18)	0.022 (2.9 to 33.3)
Expert agreement with the final conclusion child abuse (range 0–3 (3 = complete agreement))	3 (1)	2 (1)	0.363*
VAS total self-efficacy score† (range 0–800)	502 (96)	447 (98)	0.171 (−25.4 to 134.7)
Duration of case simulations (s)	662 (222)	464 (149)	0.017 (39.5 to 355.2)

Results during post-test.
*Mann–Whitney U test.
†VAS total self-efficacy score: total of all individual VAS scores.

table 3. Some components of the checklist did not improve at all, for example, the evaluation of interaction between parent and child. The final conclusion (suspicion of child abuse yes or no) of the nurse is often in line with the intended conclusion of the scenarios, both in the intervention group and in the control group (table 3).

Comparing post- and pretest results separately for the intervention and the control group showed almost significant increase in performance in the intervention group but not in the control group (table 4). A positive correlation is seen between the duration of the simulation test and the total number of adequate questions (Spearman correlation 0.586, p value 0.002). The inter-rater reliability for the three experts during post-test was found to be 0.70 (95% CI 0.51 to 0.84, p value 0.000), which can be considered good.[20]

Self-efficacy

The mean total post-test self-efficacy score was 502 in the intervention and 447 in the control group (95% CI of the difference −25.4 to 134.7) (table 3). There was a positive correlation between the total self-efficacy score and the performance on the simulation test (Spearman correlation 0.387, p value 0.056). Comparing post- and pretest results separately for the intervention and the control group showed a significant increase of the self-efficacy score in both groups (table 4).

DISCUSSION

This randomised controlled trial demonstrated improved performance in the first step in the recognition of possible child abuse during a simulation test of a child attending the ED by ED nurses after following an e-learning programme. Nurses trained in this programme asked more adequate questions to determine suspicion on child abuse. This is a positive finding which might lead to the identification of more abused children. Furthermore, asking more of the right questions might decrease the false positive rate. In our hospital only 40% of the initially screened positives for child abuse are eventually referred for an intervention, on the basis of a strong suspicion or confirmation of child abuse. The present study only evaluates the first step in the process of recognition of child abuse in a case-simulation setting. The actual accuracy of the SPUTOVAMO-R for the diagnosis physical child abuse is now being investigated in a diagnostic study CHAIN-ER (Child Abuse Inventory at Emergency Rooms). First results from this study are expected in 2011.

Ideally one would like to evaluate the effect of better recognition in the ED on the outcome of abused children. This requires well-designed, large-scale studies in which all the different steps resulting in an operationally defined better outcome for abused children are evaluated (reporting to Child Protection Services, start of appropriate interventions, inherence to interventions, outcome, etc). For our study we decided to administer a proximal test to determine the effect of an educational programme on the recognition of child abuse, a test that specifically evaluates that aspect which the intervention was designed to improve. We used an objective measurement of effect as we felt this to be more reliable than self-reported improvements in recognition as was done in other studies.[21][22] Interestingly, both groups made a reasonable final decision on the suspicion of child abuse, even though the scores for separate questions were lower in the control group. This reflects the fact that child protection assessment is multifaceted and relies not just on answers to the correct questions of a screening instrument.

This study had several limitations: first, we chose to include all nurses with a permanent ED contract to minimise loss to follow-up but this policy did not prevent a drop-out

Table 4 Comparing post- and pretest results separately for the intervention and the control group

	Pretest results	Post-test results	p Value (95% CI)
Intervention group, n = 13			
Total performance score (range 0–114)	74 (19)	89 (19)	0.053 (−29.7 to 0.2)
VAS total self-efficacy score (range 0–800)	402 (75)	502 (96)	0 (−146.5 to −54.2)
Control group, n = 12			
Total performance score (range 0–114)	69 (23)	71 (18)	0.728 (−15.5 to 11.2)
VAS total self-efficacy score (range 0–800)	364 (142)	447 (98)	0.045 (−164.4 to −2.1)

rate of 36% due to participants' shift pattern. We have no indications for selective drop-out, but this high drop-out rate might limit the generalisability of the findings. Another limitation of the study is the use of case-simulation rather than observations of clinical practice. For example, due to the simulated setting the interaction between parent and child is hard to represent and this could have influenced the outcome of that particular item. However, by using simulations of real anonymised cases of potential child abuse the measurement of performance approaches reality and translation of the results to the clinical performance in the ED seems reasonable. Furthermore, the ability to use analogous patients in the case-simulation allows comparability between participants and the potential to reveal differences between the groups. Simulation also avoids ethical issues such as the use of video recording of the performance in the ED with real patients. A third limitation is the fact that the time allowed to accomplish the task was not restricted during the case-simulations, whereas in the actual clinical practice of an ED, time might be a restrictive factor. Other barriers to a high-quality performance on history taking regarding child abuse at an ED are: violent parents, severe injuries requiring immediate actions, fear of false judgments and emotional involvement in the particular case.

The final achievement of the intervention group with a performance and self-efficacy score considerably below the maximum suggests that there might still be more to be achieved in the accuracy of child abuse screening by nurses at EDs. Our study only evaluated the first module of the training programme. The educational programme will be continued with two other modules of The Next Page and intensive communication training with actors.

With an investment of 2 h e-learning, performance in a simulated case regarding the recognition of child abuse was measurably improved in nurses working in an ED. Wider implementation of such programmes in the ED and other hospital departments, as well as in schools and primary healthcare, needs to be investigated to improve detection further. Qualified personnel trained by e-learning are a potentially valuable element in the detection of child abuse together with other modalities such as the use of compulsory checklists.

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