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Assessment of an e-learning training program for cardiotocography analysis: a multicentre randomized study

Bruno Carbonne [a,b,*], Imène Sabri-Kaci [c]

[a] Department of Obstetrics – Maternité, Hôpital Trousseau, Assistance Publique – Hôpitaux de Paris, Université Pierre et Marie Curie, Paris 6, France
[b] Department of Obstetrics and Gynecology, Centre Hospitalier Princesse Grace, Monaco
[c] Ecole de Sages-Femmes Saint-Antoine, Université Pierre et Marie Curie, Paris 6, France

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ABSTRACT

Objective: To assess the improvement of knowledge in cardiotocography (CTG) analysis, with the use of a dedicated e-learning program.
Study design: Multicentre randomized controlled trial conducted in 5 maternity departments of Eastern-Paris Perinatal network. Midwives and obstetricians were recruited on a voluntary basis. At first log-in, they were tested on CTG interpretation and on labor management. They were then randomly allocated to a "training" group ($n = 57$) with the e-learning program, or to a "no-training" group ($n = 56$). After three months, a second test was performed. Mean scores at first and second tests, rate of participants in the bottom quartile, and mean scores between doctors and midwives were compared between "training" and "no-training" groups.
Results: Seventy-five midwives and 38 obstetricians participated in the study. The mean scores at first test were similar in both groups (32.4 ± 5.2 out of 50 and 32.5 ± 4.6, $p = 0.989$). After e-learning, the results were significantly higher in the "training" group than in the "no-training" group (mean 37.1 ± 5.5 vs. 32.6 ± 5.7, respectively; $p = 0.0026$). The number of participants in the bottom quartile reached 36.0% in the "no-training" group, while it decreased to 12.6% in the "training" group ($p = 0.032$). Doctors had higher results than midwives in the first test (34.9 ± 5.9 vs. 32.4 ± 4.3; $p = 0.0048$), but not in the second test in the group with training (37.7 ± 6.7 vs. 36.8 ± 4.8; $p = 0.64$).
Conclusion: Training in CTG interpretation using an e-learning program improves the performance of obstetric staff. The possibility of logging-in from any place at any time may favor the use of an e-learning program in maternity staff.

Introduction

Cardiotocography (CTG) is extensively used for fetal monitoring during labor in obstetric units since the 1970s. After overenthusiasm about the possibility of reliably diagnosing fetal asphyxia using continuous fetal heart rate monitoring (FHR), the present trend is to quote it as a disappointing instrument, leading to increased cesarean delivery rates without obvious perinatal benefits in low risk pregnancy and labor [1].

However, nationwide surveys indicate that many of the failures of CTG to properly prevent intrapartum fetal death, are due to inadequate FHR analysis, failure to identify pathologic tracings and improper or delayed action in response to a pathologic FHR [2]. For this reason, initial and continuing training in FHR analysis is considered the best way to prevent intrapartum fetal jeopardy. Hence, the ideal way to properly train midwives and obstetricians to CTG analysis still remains to be identified.

Maternity staff is subjected to high workload, complex time-schedule at it is difficult to organize training programs based on physical presence of trainees and trainers at a defined time of the day. For these organizational reasons, the use of an e-learning program may seem particularly adequate for training labor-ward staff. However, training programs are often implemented on the intuitive perception that they will improve knowledge or skills, without proper assessment of the real benefits of training.

The aim of this study was to assess the improvement of the skills of maternity staff in pathophysiology of maternal–fetal exchanges and in FHR analysis with the use of this new web-based e-learning program.

* Corresponding author at: Department of Obstetrics and Gynecology, Centre Hospitalier Princesse Grace, Avenue Pasteur, 98000 Monaco, Monaco.
E-mail address: bruno.carbonne@chpg.mc (B. Carbonne).

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Materials and methods

We designed a prospective, multicenter randomized controlled trial comparing the effect of training or no-training with a dedicated e-learning program on the performance of maternity staff, including midwives and obstetricians, in 5 departments of obstetrics of the Eastern-Paris Perinatal Network from September 15th, 2012 to February 15th, 2013.

This program was designed in Sweden by Neoventa Medical on request of the Public patient insurance (LÖF) to improve the skills in CTG interpretation among the obstetric staff, in an attempt to decrease medical litigation. The program was translated and adapted to the French Guidelines on intrapartum fetal [3] by a group of five expert obstetricians and midwives.

The program contains 5 modules: physiology, fetal monitoring, CTG classification, clinical applications of CTG and a case-library. Each chapter contains animated illustrations, scrollable CTG tracings, study questions and a reference list including abstracts and/or full-texts. The program also contains a web-based certification test including multiple choice questions and clinical cases with questions about interpretation and clinical management. This test comprises in total 80 questions, to be answered in a maximum duration of 2 h.

Our study was opened on a voluntary basis to each midwife and obstetrician, including student midwives and residents in obstetrics, working in any of the 5 public or semi-public maternity departments of the Eastern-Paris Perinatal Network. The study was approved by an independent review board: Comité d'Ethique pour la Recherche en Obstétrique et Gynécologie (CEROG).

All members of the staff received an email inviting them to participate in the study. If interested in participating, they were redirected to a dedicated website, describing in details the study protocol. It was mentioned that individual results would be anonymously treated and blinded to the investigators.

By clicking on the adequate box for being included, the participants recognized that they had been fully informed of the study protocol and that they were consenting to participate. They had to give some information about the department they worked in, the post occupied, the number of years of practice after graduating. They were then given an individual login and password to access the e-learning program.

The study comprised 4 consecutive phases (Fig. 1):

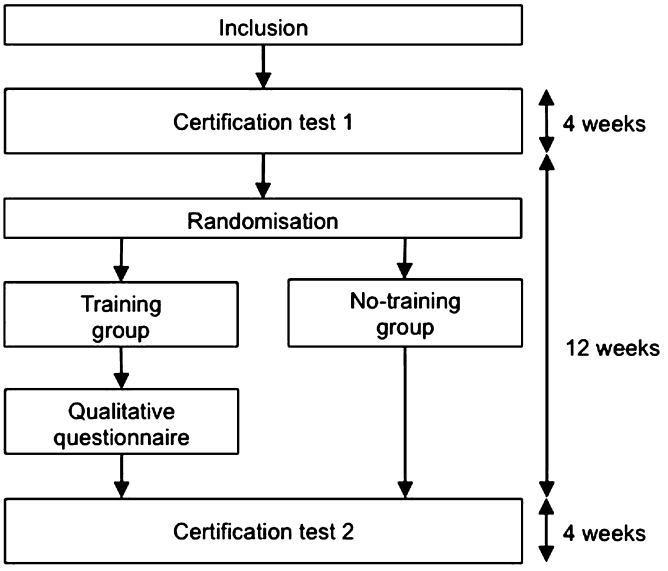

Fig. 1. Flow-chart of the study protocol.

1. First certification test:

   After first log-in, all participants had to perform a web-based certification test.
2. Randomization:

   The participants were randomized to a "training group" or a "no-training group", using a computer-generated list of random numbers. Randomization was stratified by department and by professional category in each department. Investigators were blind to the random allocation sequence.
3. Training phase:

   The participants randomized to the "training group" were asked to follow as much as possible of the 5 educational chapters. Although no individual tracking was planned, a minimum of 4 h training was recommended. The "no-training group" had no access to the educational program and received no instructions about training in this 3-months period of time.
4. Second certification test:

   All participants were invited to participate in a second web-based certification test, 3 months after entry in the study.

   The "training group" had to fill-in a "qualitative questionnaire" in which they self-assessed the time actually spent on the training program (i.e. <4 h or ≥ 4 h). No sanctions were planned in the case where the minimum required time of training was not achieved. All participants had the opportunity to comment on their subjective feeling about the program at the first and second tests.

Analysis of the results aimed at:

- Comparing the results between the "training group" and the "no-training group" at the first and the second certification tests.
- Evaluating the changes in the results obtained between the first and second certification tests in each group.
- Assessing the effect of the actual duration of training in the "training group" on the changes between first and second certification tests.
- Assessing the number of participants below the first quartile (of the entire study-population) at first and second certification test for each group
- Comparing the results obtained by midwives and by doctors, and the effect of training on both professional groups.

Continuous data were compared using paired or unpaired Student's *t*-test after checking that the data were normally distributed, and discrete data were compared using Chi-square test or Fisher exact test as appropriate. Data were analyzed with MedCalc statistical software (www.medcalc.be); $p < 0.05$ was considered statistically significant.

Results

Seventy-five midwives or student midwives, and 38 obstetricians or resident obstetricians (total 113), from 5 maternity departments, voluntarily participated into the study. There were 57 participants allocated to the "training group" and 56 to the "no-training group". The characteristics of the professionals are presented in Table 1.

The results obtained at the 1st and 2nd tests for each group are presented in Tables 2 and 3. There was a loss of participants between the first test and the second test. This loss tended to be higher in the "no-training group" (from 56 to 28, i.e. 50% loss) than in the "training group" (from 57 to 35, i.e. 36.8% loss), although not significantly (χ^2-test; $p = 0.234$).

When considering all tests available (Table 2), the results were similar between both groups before training. The results at