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### Delay in safe motherhood

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## Chapter 4

# **A systematic review of the effectiveness of training in emergency obstetric care in low resource environments**

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## Abstract

**Background:** Training of health care workers can play an important role in improving quality of care and reducing maternal and perinatal mortality and morbidity.

**Objectives:** To assess the effectiveness of training programs aimed at improving emergency obstetric care in low resource environments.

**Search Strategy:** We searched Pubmed, Embase, Popline and selected websites and manually searched bibliographies of selected articles. Language was not an exclusion criterion.

**Selection Criteria:** All papers describing postgraduate training programs aimed at improving emergency obstetric care in low resource environments were included.

**Data Collection and Analysis:** Two reviewers independently extracted the data and classified these according to the level of the measured effects (reaction of participants, improved knowledge and skills, changes in behaviour, outcomes in practice). Any disagreements were resolved by discussion with a third author until agreement was reached.

**Main Results:** A total of 38 papers were selected. Training programs may vary considerably in length, content and design. The evaluation of effects is often hampered by inadequate study design and the use of non-validated measuring instruments. Most papers describe positive reactions, increased knowledge and skills, and improved behaviour after training. Outcome is assessed less frequently and positive effects are not always demonstrated. Measures that can contribute to a positive effect of training programs include hands-on practice, team approaches and follow-up on training efforts.

**Conclusions:** Training programs may improve quality of care but strong evidence is lacking. Policymakers need to include evaluation and reporting of effects in project budgets for new training programs.

## Introduction

Estimates from 2005 show that annually 535,900 women die during pregnancy, childbirth or the postpartum period, mainly in sub-Saharan Africa and Asia.<sup>1</sup> One of the key elements in reducing maternal mortality is to ensure that during pregnancy, childbirth and the immediate postpartum period all women have access to skilled care, delivered by trained health professionals, such as a midwives, non-physician clinicians, doctors or nurses.<sup>2;3</sup> However, the levels of knowledge and skills of birth attendants in low resource countries often do not meet the required standards. Training may help to improve the quality of care.<sup>4-6</sup>

This review assesses the effects of postgraduate training programs to improve the skills and knowledge of trained health care professionals who are involved in maternal and perinatal care. We categorized the results based on four levels, described by Kirkpatrick, at which effectiveness of training can be measured:<sup>7</sup>

1. How do the trainees react to the training: do they like it; do they think it is useful?
2. Does the training improve knowledge, and does it improve technical skills (e.g. do people know the indications for a vacuum extraction and do they demonstrate the technical ability to do so)?
3. Does the training also lead to the use of this knowledge and skills in practice (e.g. does training lead to an increase in the number of vacuum deliveries).?
4. Does the training improve outcome (e.g. an increase in the number of vacuum deliveries performed for fetal distress or reduced number of neonates born with a low APGAR score)?

We also aimed to derive lessons from the reviewed papers that may help policymakers in deciding how to effectively train health workers in low resource environments.

## Methods

We searched Pubmed, Embase, African Journals Online and Popline up to 31 December 2007, using combinations of the following keywords: 'train\*', 'education', 'staff development', 'educational measurement', 'patient simulation', 'in-service training'; combined with 'obstetrics' and 'pregnancy'. In addition, we searched selected websites and used 'Web of Science', specifically looking for articles that referred to the papers included in the review. Bibliographies of selected papers were also manually searched. (See appendix 1 for complete search strategy). This process helped to identify unpublished evaluation reports and relevant articles.

We selected papers (defined as any written document, including peer-reviewed articles, evaluation reports, theses and conference abstracts) describing courses for professional birth attendants as defined by WHO (Box 1), in low-resource environments. We excluded papers describing medical curricula or specialist training programs. Training of traditional birth attendants was also outside the scope of the review. Editorials, opinions and reviews were excluded unless they included direct results of training.

Training in low-resource countries is often supported by governmental or non-governmental organizations and evaluated as part of the funding process. Although we tried to retrieve such evaluation reports, many are not available in the public domain and could therefore not be included in this review.

**Box 1.** Definition of a skilled birth attendant by World Health Organisation, International Confederation of Midwives, and International Federation of Gynaecology and Obstetrics.<sup>2</sup>

‘A skilled attendant is an accredited health professional- such as a midwife, doctor, or nurse- who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth, and the immediate postnatal period, and in the identification, management, and referral of complications in women and newborns.’

Two authors (LvL and AD, both gynaecologists with experience in training for obstetric emergencies) screened the titles and abstracts of the papers resulting from the initial search to determine if they met the selection criteria. If there were doubts, the full paper was retrieved. The selected papers were classified by two reviewers (LvL and AD), independently, using two complementary systems. First, the studies were categorized according to Kirkpatrick’s four levels at which the effect of training can be measured (Box 2).<sup>7</sup> Secondly, the study designs evaluating the effects of training were identified and classified using the level of evidence system commonly used in preparing evidence based practice guidelines.<sup>8</sup> In this system randomized controlled trials are considered to produce stronger evidence for the relation between exposure and effect than a case control study for instance (Box 3). In two cases of uncertainty about the classification, a third author specialized in evaluation of education (AS) was consulted, and the classification was discussed until agreement was reached. Data with regard to training specifics such as length, training content, and participants were extracted using a standardized data extraction form.

**Box 2.** Effect of training; levels of Kirkpatrick<sup>7</sup>

**Level 1:** Reaction: How well trainees liked the program as assessed by an evaluation form at the end of the course.

**Level 2:** Learning: What principles, facts and techniques were learned? What attitudes were changed? Improvement is usually assessed by a written exam at the end of the course. When assessing practical skills a skills demonstration may be used on a simulated case. Clinical decision making might be assessed by written case scenarios.

**Level 3:** Behaviour: What changes in job behaviour resulted from the program? Were certain practices used?

**Level 4:** Outcome: What are the tangible results of the program in terms of patient outcome, reduced cost, improved quality etc.?

**Box 3.** Oxford levels of evidence<sup>8</sup>

**Ia** Evidence from meta-analysis of randomized controlled trials

**Ib** Evidence from at least one randomized controlled trial

**IIa** Evidence from at least one controlled study without randomization

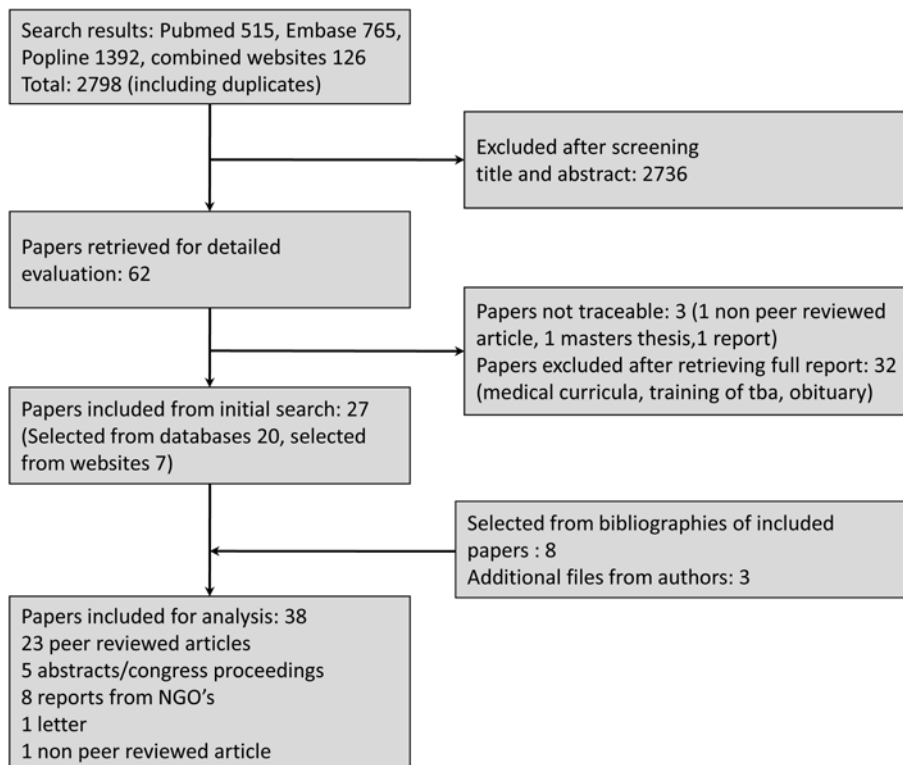
**IIb** Evidence from at least one other type of quasi-experimental study

**III** Evidence from non-experimental descriptive studies, such as comparative studies, correlation studies and case-control studies

**IV** Evidence from expert committee reports or opinions and/or clinical experience of respected authorities

## Results

The literature search resulted in 2789 papers. Screening of titles and abstracts yielded 62 papers which were retrieved for further examination; 27 of these met the inclusion criteria. Twenty of these were identified from the literature search and seven from the selected websites (figure 1). A further eight papers were identified through hand searching of bibliographies of selected papers. Three papers were identified outside the search, one was written by one of the authors, one was an evaluation report identified by coincidence in the bibliography of a report on maternal mortality in Malawi and one was an abstract from a conference attended by one of the authors. Thus a total of 38 papers describing a course and/or evaluating its effects were included in the systematic review (Figure 1). For one of the included peer-reviewed articles it was uncertain whether the trainees met the definition of 'skilled attendant' (Box 1).



**Figure 1.** Search flow profile.

We classified the studies by duration of the course.

- Short course: 1 week or less.<sup>9-15</sup>
- Courses of longer duration: 1-8 weeks.<sup>16-33,46</sup>
- Self directed learning: variable timeline.<sup>34-46</sup>

These three types are described using the Kirkpatrick system. Studies with evidence levels 1-3 are summarised in table 1.

### Short Courses

The Advanced Life Support in Obstetrics, the Managing Obstetric Emergencies and Trauma, and the Royal College of Obstetricians and Gynaecologists (RCOG)/ Liverpool School of Tropical Medicine (LSTM) Life Saving Skills Essential Obstetric Care and Neonatal Care courses are all based on the experience from similar life support courses such as the Advanced Trauma Life Support and the Advanced Cardiac Life Support.<sup>9-14,47</sup> These two-day courses include short classes, alternating between theoretical and practical sessions using simulation, to train for emergency situations such as shoulder dystocia, severe bleeding, severe pre-eclampsia and eclampsia, breech delivery and instrumental vaginal delivery, and neonatal resuscitation.

The Essential Obstetric Care Manual for Health Care Providers in Kenya lasts five days and includes practical sessions in a district hospital combined with theoretical classes outside the hospital. Apart from covering the management of uncomplicated labour and delivery, and complications and use of the partograph, the course also emphasizes improvement of communication skills. Training efforts are supported by follow-up supervisory visits and on-the-job training.<sup>15</sup>

## **Effect**

Most short courses invoke positive reactions from participants and are successfully implemented in many countries.<sup>12-15</sup> Participants generally show improved knowledge on written examination.<sup>13-15</sup> To evaluate the Kenyan five-day course, a baseline survey was compared with an end line survey after three years which showed changes in behaviour (Kirkpatrick level 3), with increased ascertainment of cervical dilatation to establish the onset of labour, increased use of the partograph, and improved infection prevention measures. The quality of monitoring improved with blood pressure being taken more frequently, and a larger proportion of healthcare providers reported they checked uterine contractions and monitored temperature. More women reported having been treated with respect at the health facilities. The endline survey also showed changes in outcome (Kirkpatrick level 4): the number of women with prolonged labour declined and fewer women were recorded to have had fits.<sup>15</sup>

## **Courses of longer duration**

Nineteen of the 38 papers describe a total of 13 different training programs taking between one and eight weeks.<sup>16-33; 46</sup> Four programs are described in more than one paper. (table 1) Most of these programs are broader in scope than the short courses and aim at overall quality improvement, covering topics beyond life-saving skills, such as antenatal care, uncomplicated labour and delivery, infection prevention, team cooperation, communication, prevention of mother to child HIV transmission, and promotion of breastfeeding. Nine of the 13 programs reported the use of clinical practice to teach skills. In Indonesia the American College of Nurse-Midwives life-saving skills course is augmented by peer review and continuing education.<sup>23</sup> In the WHO midwifery training modules new teaching methods such as the use of drama, learning games and group work are used.<sup>17;18</sup>

## **Effect**

Participants' reactions (Kirkpatrick level 1) were assessed in several studies: course content and new teaching methods used in the WHO modules were appreciated by the teachers in several countries in which the modules were tested.<sup>17;18</sup> The practical approach to teaching skills and knowledge on obstetric emergencies in one course resulted in such good feedback that this teaching method was also introduced in pre-service midwifery training.<sup>19;24</sup> In the ten studies in which knowledge and skills were assessed (Kirkpatrick level 2), six



studies showed little or no improvement, for instance in knowledge about antenatal care, labour and delivery, the use of partograph and managing obstetric emergencies.<sup>24-26;32;33;46</sup> Four studies demonstrated improved skills and knowledge.<sup>18;20;22;23</sup> In Indonesia one study compared different approaches to skill training. One group of midwives who were trained intensively had the opportunity to practice and use their skills by attending at least 15 births supported by peer review and continuing education. These midwives scored better on a skills evaluation compared to a group of midwives trained with less patient exposure and without follow-up support. No differences were found in infection prevention practices and use of the partograph.<sup>23</sup> Some papers report a change in behaviour of participants (Kirkpatrick level 3), including successful use of the partograph, more frequent performance of manual removal of placenta and the bimanual uterine compression technique, and increased attention to cleanliness and aseptic techniques.<sup>19;20</sup> Other positive behavioural changes noted were greater awareness of deficiencies in care as observed by the hospital management,<sup>25</sup> improved identification of life-threatening conditions, differences in management of life threatening conditions,<sup>21;24</sup> and the correct application of newly acquired skills, such as managing postpartum haemorrhage, severe anaemia, retained placenta and pre-eclampsia.<sup>27</sup> Improved teamwork and communication were also observed.<sup>26;29</sup> One paper reported no improvement of routine antenatal care practice following a three-week residential course.<sup>46</sup> Few papers reported improvement in outcomes (Kirkpatrick level 4). In one paper, the number of appropriate referrals increased dramatically (>200%), patient satisfaction improved, and the time from admission to initiation of treatment declined. However, no change in Caesarean section rate or perinatal outcome was demonstrated.<sup>28</sup>

### **Self-directed learning**

Thirteen papers described self-directed learning programs offering no scheduled course, but a set of learning materials that students mastered individually at times convenient for themselves.<sup>34-46</sup> This concept was applied in multiple ways: The Perinatal Education Programme provided continuing medical education to midwives working in rural areas. It used a maternal and newborn care manual consisting of theory units and skills workshops covering common and important problems faced by rural midwives and doctors.<sup>34-42</sup> Participants mastered the theory usually in self-selected groups, whereas skills workshops were conducted with the help of a local resource person identified by the students who can demonstrate the skill - usually a doctor.<sup>34;35</sup> Students were supported by supervisory visits. In Mexico and Thailand, the Reproductive Health Library, an annually updated electronic publication aimed at disseminating evidence-based practices, was introduced through a series of workshops encouraging staff to access the database by themselves.<sup>43</sup> In Tanzania, a distance-learning approach was piloted aimed at medical officers working in rural stations. Students kept a

diary to record and plan their own learning and were supported by visits from tutors.<sup>44</sup> In Ghana the Self Paced Learning program relied on self study for the theoretical part, and students travelled to a designated training site to practice skills with models and to be assessed.<sup>46</sup>

## **Effect**

The reaction of participants (Kirkpatrick level 1) was not measured. The effect of self-directed learning programs on knowledge and skills (Kirkpatrick level 2) was assessed in several studies. The Perinatal Education Program, and the Reproductive Health Library and Self Paced Learning programs all resulted in improved knowledge. The Perinatal Education Program also resulted in improved practical skills on a number of antenatal and intrapartum procedures.<sup>36-40</sup>

Change in behaviour (Kirkpatrick level 3) was less evident. After the Perinatal Education Program the use of the antenatal card improved in some aspects but not all, and no difference was found in referral rates and clinical parameters such as syphilis testing, blood grouping and pelvimetry.<sup>41;42</sup> The general introduction of the Perinatal Education Program brought teaching and practice of nurses and doctors together in a standardized approach to perinatal care in South Africa.<sup>34</sup> After the introduction of the Reproductive Health Library, a review of patient charts showed no change in the use of social support, use of magnesium sulphate and corticosteroids for foetal lung maturity, selective use of episiotomy, use of vacuum extraction or the use of antibiotics with caesarean sections.<sup>43</sup>

## **Discussion**

Many of the studies included in the review used nonvalidated measuring instruments to evaluate the effects of programs, or they measured effects only at Kirkpatrick levels 1 or 2. Most papers describe positive reactions, increased knowledge and skills, and improved behaviour after training. Kirkpatrick level 4 was assessed in a minority of the studies and these did not uniformly report positive effects.

Nevertheless, some lessons can be derived from the combined experiences in the different countries and settings from the papers included in the review. Care should be taken when applying these lessons as the evaluations were not rigorous.

Table 1: Characteristics and outcome of papers with evidence levels of I-III (papers with evidence level IV are not included)

Authors and year	Countries	No trainees	Approach for assessing effects	Article type	Kirkpatrick level				Description of effect
					1	2	3	4	
					Reaction	Learning	Behaviour	Outcome	
<b>SHORT COURSES</b>									
<b>Managing Obstetric Emergencies and Trauma (MOET)</b>									
Johanson <i>et al.</i> 2002 <sup>33</sup>	Bangladesh	9	Pre and post training test scores	Peer reviewed article	III	III			Knowledge improved. Uptake of MOET principles by one teacher.
<b>RCOG-LSTM Life Saving Skills an Essential Obstetric Care and Neonatal Care</b>									
v Lonkhuijzen <i>et al.</i> 2008 <sup>44</sup>	Tanzania	31	Pre and post training test scores	Peer reviewed article	IV	III			Knowledge improved, enthusiastic participants.
<b>Essential Obstetric Care Manual for Health Care Providers in Kenya</b>									
Warren and Liambila 2004 <sup>15</sup>	Kenya	142	Pre and post test using several measurement tools	Report	III	III	III		Knowledge, use of partograph, infection prevention and use of cervical dilatation all improved. Women were treated with more respect
<b>COURSES OF LONGER DURATION</b>									
<b>World Health Organization Midwifery Training Modules</b>									
O'Heir 1997 <sup>46</sup>	Ethiopia, Lesotho, Nepal, Fiji, Mozambique	142	Pre en Post Training test scores	Peer reviewed article	III	III			Participants and teachers were content with the course. Students showed improved knowledge.
<b>American College of Nurse-Midwives Life Saving Skills</b>									
Sloan <i>et al.</i> 2005 <sup>21</sup>	Vietnam	24	Quasi Experimental comparing 3 groups	Peer reviewed article			IIb		More life threatening conditions identified but low levels of essential management
<b>ACNMI Life Saving Skills, Continuing Education and Peer Review</b>									
Jonas 2000 <sup>22</sup>	Indonesia	80	Post training test comparing 3 trained and untrained groups	Report		III			Trained midwives had better knowledge and skills as compared to untrained midwives but did not reach acceptable levels.
mc Dermott <i>et al.</i> 2001 <sup>23</sup>	Indonesia	108	Post training test comparing 3 trained and untrained groups	Peer reviewed article	III	III	IV		Improved knowledge and skills, with best results in intensive program, no difference in infection prevention and use of partograph

Author	Year	Country	Sample Size	Intervention	Report	Level	Findings
<b>Malawi Safe Motherhood Project</b>							
Kroeger <i>et al.</i>	2003 <sup>41</sup>	Malawi	79	Post training test of knowledge	Report	III	Mixed results on post test knowledge and skills. Incidental observation of clinical practice was poor.
<b>Mothercare</b>							
Jonas	2000 <sup>25</sup>	Guatemala	22	Post training skills and knowledge test	Report	III	No difference in knowledge between groups, but skills improved with training and improved teamwork
Jonas	2000 <sup>26</sup>	Bolivia	17	Post training skills and knowledge test	Report	III	No difference in knowledge. Skills improved but still insufficient after training
<b>Other</b>							
O'Rourke	1995 <sup>28</sup>	Guatemala	-	Pre and post training patient outcome	Peer reviewed article	III	Increased patient satisfaction
Otero <i>et al.</i>	2003 <sup>29</sup>	Kenya	-	Pre and post training patient outcome	Abstract	III	Increased referral rate and institutional deliveries. Increased use of infection prevention
Naziri <i>et al.</i>	2003 <sup>31</sup>	Afghanistan	23	Post training test	Abstract	III	All participants passed a knowledge and skills test
Carrough, McCall	2005 <sup>33</sup>	Nepal	104	Post training skills test comparing with and without training	Peer reviewed article	III	Trained Maternal Child Health workers scored better on skills tests.
Osei <i>et al.</i>	2005 <sup>46</sup>	Ghana	60	Quasi Experimental comparing 2 training methods	Report	IIb	Knowledge declined and more than 50% failed to reach 70% score

Table 1 continued

SELF DIRECTED LEARNING						
<b>Perinatal Education Program</b>						
Woods and Theron 1995 <sup>36</sup>	South Africa	114	Uncontrolled before and after study	Peer reviewed article	III	Knowledge improved after training
Theron 1999 <sup>37</sup>	South Africa	93	Controlled trial	Peer reviewed article	Ila	Attitude towards work improved in study town no change in control town.
Theron 1999 <sup>38</sup>	South Africa	93	Controlled Trial	Peer reviewed article	Ila	Knowledge improved in intervention group, no change in control group
Theron 2000 <sup>39</sup>	South Africa	73	Controlled Trial	Peer reviewed article	Ila	Skills improved in study town
Theron 1999 <sup>40</sup>	South Africa	93	Controlled Trial	Peer reviewed article	Ila	Knowledge improved when completing antenatal card and partograph
Theron 1999 <sup>41</sup>	South Africa	93	Controlled Trial	Peer reviewed article	Ila	Use of antenatal card showed improvement on some points no change in others, Partograph use improved in some but deteriorated in others
le Roux, <i>et al.</i> 1998 <sup>42</sup>	South Africa	8	Semi-controlled before and after study	Peer reviewed article	IIb	No effect of the course was found in clinical parameters such as measuring uterine growth, pelvimetry and measuring of dilatation.
<b>Other</b>						
Gulmezoglu <i>et al.</i> 2007 <sup>43</sup>	Mexico Thailand	465	Cluster randomised trial	Peer reviewed article	Ib	Awareness and use of RHL increased. No change in target practices (social support, selective use of episiotomy etc.)
Osei 2005 <sup>46</sup>	Ghana	60	Quasi Experimental comparing 2 training methods	Report	IIb	Knowledge improved but remained low for most participants, no change in observed antenatal care practices

## **Practising skills**

The fact that all programs include some form of skills training suggests that practicing skills is considered an important aspect of training. However, only one paper compared different approaches to skill training and found a beneficial effect of increased clinical practice.<sup>23</sup> The longer duration courses more often used clinical practice instead of simulation training as compared to the short courses and self-directed learning programs. This could be related to the limited time frame of the short courses and the design which uses a quick succession of theory and practice. There is no evidence in superiority of one training method over another. The choice of method for transferring skills therefore may have depended on logistical aspects of a course design.

## **Team approach**

In western European countries ineffective teamwork and communication have been proven to contribute to maternal and perinatal mortality.<sup>48</sup> There is no reason to believe that teamwork is less important in low-resource settings.<sup>49</sup> Participants who train as a team will be able to teach and learn from each other. This aspect possibly played a role in the success of the PEP program in South Africa.<sup>34</sup> Good teamwork may contribute to mutual respect between healthcare workers, and also between midwives and traditional birth attendants, as was the case in Guatemala, where it was associated with increased numbers of referrals.<sup>28</sup>

## **Follow-up**

Supervisory visits possibly helped sustain results of self-paced learning.<sup>50</sup> In Indonesia, peer review and continuing education after skill training led to better scores on skill performance compared to the same course without follow-up.<sup>23</sup> Several issues were observed by the authors of different papers as contributing factors to the success of a training course: for example, the effectiveness of training is also determined by the health care settings in which professionals work. Are the necessary resources available and will the women in need be able to reach the facility? Some authors argue that if this enabling environment is not available, training will only be effective as part of a wider safe motherhood program.<sup>15;21;24</sup> Discussing the course content with stakeholders such as government agencies, professional associations and staff and management of teaching hospitals may contribute to the success of a course.<sup>15;18;27;44</sup>

Limitations of the studies included in the review relate to the evidence levels that are presented and the methods used to gather that evidence. Of the 38 included papers, 15 failed to assess the outcomes of the program in question (Evidence level IV). The five studies that evaluated effect on outcome (Kirkpatrick level 4) did so using an observational design or by merely assuming such outcomes without proper evaluation. Furthermore, reporting bias in favour of positive results cannot be excluded, particularly in non-peer-reviewed reports from non-

governmental organizations, which usually serve to justify a program and its associated costs.

Several recommendations can be made to improve reporting and evaluation of courses across the different Kirkpatrick levels. Although a clinician might want to focus on Kirkpatrick level 4, the other three levels are equally important to determine the success of a course.<sup>7</sup> The reaction of participants (Kirkpatrick level 1) can usually be measured by administering a questionnaire after a course. To test a change in knowledge (Kirkpatrick level 2) a counterbalance design is required (both halves of a group are given a different knowledge pre-test, and after the training the tests are switched between the groups).<sup>51</sup> Measuring behavioural change, in other words whether and how participants actually use their newly acquired knowledge and skills in practice (Kirkpatrick level 3), is challenging. Clinical behaviour, such as team cooperation can best be measured using a reliable and valid assessment instrument such as the Clinical Teamwork Scale.<sup>52</sup> Alternatively proxy measures such as patient reports, clinicians self-reports or medical record reviews might be used, but the evidence for the use of these methods is limited.<sup>53</sup> Ultimately, the objective of training in safe motherhood is improved outcomes (Kirkpatrick level 4) for pregnant women and newborns. Measuring the effect of training on behaviour and on the outcome of obstetric emergencies is hampered by the low frequency of emergencies. Changes in both behaviour and outcome are best assessed using cluster randomised trials of which the study evaluating the effect of the Reproductive Health Library is an example.<sup>43</sup> However, experience with this trial also teaches us that designing and implementing such a trial is time consuming and challenging,<sup>54</sup> Reports on training programs should ideally include a description of the course content and the teaching modalities, the cost involved, how sustainability is assured, how trainers are prepared for their task, and if the training is part of a larger safe motherhood program.

## **Conclusion**

The articles examined in this review have limitations which hamper their usefulness in evaluating the effects of postgraduate educational interventions to improve obstetric care in low resource environments. Failure of most studies to underpin the results with adequate evidence precludes valid pronouncements on the effectiveness of the courses described.

Although the introduction of the Reproductive Health Library and the Perinatal Education Program led to an improvement in knowledge and skills, no positive effects on behaviour were reported and patient outcomes were not evaluated. It is the responsibility of organisations that initiate and fund training programs to make evaluation an integral part of programs and ensure that the results, assessed by a proper peer-reviewed process, are made available to those who

stand to benefit the most from a successful program. Large parts of the world are behind schedule in reaching the fourth and fifth Millennium Development Goals. Improving knowledge and skills through training can contribute to the attainment of these Goals. In order to do so successfully, sound research is needed to provide reliable evidence to support the implementation of effective training programs.



## Reference list

1. Hill K, Thomas K, AbouZahr C, Walker N, Say L, Inoue M et al. Estimates of maternal mortality worldwide between 1990 and 2005: an assessment of available data. *Lancet* 2007; 370(9595):1311-1319.
2. World Health Organisation. Making pregnancy safer: the critical role of the skilled attendant: A joint statement by WHO, ICM and FIGO. 2004. Geneva, WHO Making Pregnancy Safer Department of Reproductive Health and Research.
3. Mullan F, Frehywot S. Non-physician clinicians in 47 sub-Saharan African countries. *Lancet* 2007; 370(9605):2158-2163.
4. Kwast BE. Quality of care in reproductive health programmes: education for quality improvement. *Midwifery* 1998; 14:131-136.
5. Draycott T, Sibanda T, Owen L, Akande V, Winter C, Reading S et al. Does training in obstetric emergencies improve neonatal outcome? *BJOG* 2006; 113(2):177-182.
6. Black RS, Brocklehurst P. A systematic review of training in acute obstetric emergencies. *Bjog-An International Journal of Obstetrics and Gynaecology* 2003; 110(9):837-841.
7. Kirkpatrick D. Great ideas revisited. Techniques for evaluating training programs. Revisiting Kirkpatrick's four-level model. *Training and Development* 1996; 50(1):54-59.
8. Eccles M, Mason J. How to develop cost-conscious guidelines. *Health Technol Assess* 2001; 5(16):1-69.
9. Blackwell-Smyth P, Breen M, Hinshaw K. Learning from low income countries: what are the lessons?: Hands on course may help deliver obstetric care. *BMJ* 2004; 329(7475):1184.
10. Deutchman M, Dresang L, Winslow D. Advanced life support in obstetrics (ALSO) international development. *Fam Med* 2007; 39(9):618-622.
11. Meguid T, Keating K, Alnaes-Katjavivi P. Introducing the advanced life support in obstetrics (also) course in Malawi. *Tropical Medicine & International Health* 12[Suppl 1], 20. 2007.
12. Dresang LT, Rodney WM, Leeman L, Dees J, Koch P, Palencia M. Advanced life support in obstetrics in Ecuador: Teaching the teachers. *Journal of the American Board of Family Practice* 2004; 17(4):276-282.
13. Johanson R, Akhtar S, Edwards C, Dewan F, Haque Y, Jones P et al. MOET: Bangladesh - An initial experience. *J Obstet Gynaecol Res* 2002; 28(4):217-223.
14. van Lonkhuijzen L, Ameh C, Mdegela M, Hulsbergen M, Stekelenburg J, van den Broek N. Life Saving Skills: Essential Obstetric and Newborn Care training in Tanzania. *NTOG* 2008; 121(6):159-161.

15. Warren C, Liambila W. Safe Motherhood Demonstration Project Western Province. Approaches to providing quality maternal care in Kenya. 2004. Nairobi, Population Council.
16. Maclean GD. Education aspects of giving midwifery care for the 1990s. *Midwives Chron* 1993; 106(1262):72-77.
17. Maclean GD, Tickner VJ. A preliminary evaluation of education material prepared for the Safe Motherhood Initiative Educational Project. *Midwifery* 1992; 8(3):143-148.
18. O'Heir JM. Midwifery education for safe motherhood. *Midwifery* 1997; 13(3):115-124.
19. Taylor JE. Life-saving skills training for midwives: report on the Ghanaian experience. *Int J Gynaecol Obstet* 1992; 38 Suppl:S41-3.:S41-S43.
20. Taylor. Ghana Life saving skills effort. In: Meashem DM, Kallianes VD, editors. *Issues in essential obstetric care. Report of a technical meeting of the Inter-Agency Group for Safe Motherhood, May 31 - June 2, 1995.* New York: Population Council; 1996. 45-47.
21. Sloan NL, Nguyen TN, Do TH, Quimby C, Winikoff B, Fassihian G. Effectiveness of lifesaving skills training and improving institutional emergency obstetric care readiness in Lam Dong, Vietnam. *J Midwifery Womens Health* 2005; 50(4):315-323.
22. Jonas E. Improving Provider Performance- An Exploration of the Literature, Box 2-- Indonesia In-Service Training. *MotherCare Matters* 2000; 9(2):7-9.
23. McDermott J, Beck D, Buffington ST, Annas J, Supratikto G, Prenggono D et al. Two models of in-service training to improve midwifery skills: how well do they work? *J Midwifery Womens Health* 2001; 46(4):217-225.
24. Kroeger M, Kaphagawani N, Kafulafula UK, Maluwa VM. Final Evaluation of the Malawi Safe Motherhood Project Life Saving Skills Training Programme. 2003. Blantyre, DFID/ Safe Motherhood Project.
25. Jonas E. Improving Provider Performance- An Exploration of the Literature, Box 1--Guatamala In-Service Training. *MotherCare Matters* 2000; 9(2):4-6.
26. Jonas E. Improving Provider Performance- An Exploration of the Literature, Box 3-- Bolivia In-Service Training. *MotherCare Matters* 2000; 9(2):10-11.
27. Thairu A, Schmidt K. Training and authorising mid level providers in Life Saving Skills in Kenya Case study No 8. In: Crump S, editor. *Shaping policy for maternal and newborn health: a compendium of case studies.* Baltimore, Maryland: JHPIEGO; 2003. 69-75.
28. O'Rourke K. The effect of hospital staff training on management of obstetrical patients referred by traditional birth attendants. *Int J Gynaecol Obstet* 1995; 48 Suppl:S95-102.:S95-102.
29. Orero S, Oguttu M, Omondi E, Oyoo C, isore A, mbaka C. The importance of Life Saving Skills (LSS) training for mid-level providers of Emergency Obstetric Care (EmOC) in a low resource setting. Network conference

- 2003, Book of Abstracts , 62. 2003. Averting Maternal Death and Disability (AMDD) Program Mailman School of Public Health, Columbia University.
30. Hoang Thi Bang, Ha Thanh Binh, Pham Bich Ha, Otchere SA. Using hands-on training in Emergency Obstetric Care (EmOC) to improve staff skills. Network conference 2003, Book of Abstracts , 64. 2003. Averting Maternal Death and Disability (AMDD) Program Mailman School of Public Health, Columbia University.
  31. Naziri m, Quyum N, Jami H, Rahim M, Sekhandary F, Mouniri H et al. Establishing EmOC in a post-conflict environment through Competency-Based Training and a roll-out implementation process. Network conference 2003, Book of Abstracts , 56. 2003. Averting Maternal Death and Disability (AMDD) Program Mailman School of Public Health, Columbia University.
  32. Kayo DA, Bagayoko A. Training in Life Saving Skills (LSS) for managing obstetric emergencies. Network conference 2003, Book of Abstracts , 66. 2003. Averting Maternal Death and Disability (AMDD) Program Mailman School of Public Health, Columbia University.
  33. Carlough M, McCall M. Skilled birth attendance: what does it mean and how can it be measured? A clinical skills assessment of maternal and child health workers in Nepal. *Int J Gynaecol Obstet* 2005; 89(2):200-208.
  34. Woods DL. An innovative programme for training in maternal and newborn care. *Semin Neonatol* 1999; 4(3):209-216.
  35. Woods DL, Theron GB. The Perinatal-Education-Program. *S Afr Med J* 1994; 84(2):61.
  36. Woods DL, Theron GB. The Impact of the Perinatal Education-Program on Cognitive Knowledge in Midwives. *S Afr Med J* 1995; 85(3):150-153.
  37. Theron GB. The effect of the Maternal Care Manual of the Perinatal Education Programme on the attitude of midwives towards their work. *Curationis* 1999; 22(4):63-68.
  38. Theron GB. Improved cognitive knowledge of midwives practising in the Eastern Cape Province of the Republic of South Africa through the study of a self-education manual. *Midwifery* 1999; 15(2):66-71.
  39. Theron GB. Improved practical skills of midwives practicing in the Eastern Cape Province of the Republic of South Africa through the study of a self-education manual. *J Perinatol* 2000; 20(3):184-188.
  40. Theron GB. Effect of the maternal care manual of the perinatal education programme on the ability of midwives to interpret antenatal cards and partograms. *J Perinatol* 1999; 19(6 Pt 1):432-435.
  41. Theron GB. Effect of the Maternal Care Manual from the perinatal education programme on the quality of antenatal and intrapartum care rendered by midwives. *S Afr Med J* 1999; 89(3):336-342.

42. le Roux E, Pattinson RC, Tsaku W, Makin JD. Does successful completion of the Perinatal Education Programme result in improved obstetric practice? *S Afr Med J* 1998; 88(2 Suppl):180-182, 184, 187.
43. Gulmezoglu AM, Langer A, Piaggio G, Lumbiganon P, Villar J, Grimshaw J. Cluster randomised trial of an active, multifaceted educational intervention based on the WHO Reproductive Health Library to improve obstetric practices. *BJOG* 2007; 114(1):16-23.
44. Ndeki SS, Towle A, Engel CE, Parry EH. Doctors' continuing education in Tanzania: distance learning. *World Health Forum* 1995; 16(1):59-65.
45. A Pilot Study: Distance Learning Course on Pregnancy, Childbirth, Postpartum and Newborn care for primary health care workers in Mongolia. *Making Pregnancy safer* 2008;(3):6.
46. Osei I, Garshong B, Banahene GO, Gyapong J, Tapsoba P, Askew I et al. Improving the Ghanaian Safe Motherhood Programme. Evaluating the effectiveness of alternative training models and other performance factors on the quality of maternal care and client outcomes. 2005. Washington DC, Population Council. FRONTIERS final report.
47. van den Broek N. *Life Saving Skills Manual - Essential Obstetric and Newborn Care*. London: RCOG Press; 2006.
48. Sentinel Event Alert #30, Preventing infant death and injury during delivery. 2004 [[http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea\\_30.htm](http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_30.htm)]
49. Guise JM, Segel S. Teamwork in obstetric critical care. *Best Pract Res Clin Obstet Gynaecol* 2008; 22(5):937-951.
50. Penny S, Murray SF. Training initiatives for essential obstetric care in developing countries: a 'state of the art' review. *Health Policy Plan* 2000; 15(4):386-393.
51. Fraenkel JR, Wallen NE. *Experimental Research. How to Design and Evaluate Research in Education*. 6 ed. Boston: Mc Graw Hill; 2006. 278.
52. Guise JM, Deering SH, Kanki BG, Osterweil P, Li H, Mori M, Lowe NK. Validation of a tool to measure and promote clinical teamwork. *Simulation in Healthcare* 2008;3(4):217-223
53. Hrisos S, Eccles M, Francis J, Dickinson H, Kaner E, Beyer F et al. Are there valid proxy measures of clinical behaviour? a systematic review. *Implementation Science* 2009; 4(1):37.
54. Gulmezoglu AM, Villar J, Grimshaw J, Piaggio G, Lumbiganon P, Langer A. Cluster randomised trial of an active, multifaceted information dissemination intervention based on the WHO Reproductive Health Library to change obstetric practices: methods and design issues [ISRCTN14055385] *BMC Med Res Methodol* 2004;4(1):2

## Appendix. 1 Review methodology

To identify reports describing postgraduate educational interventions aimed at improving obstetric care, Pubmed, Embase, African Journals Online and Popline were searched up to 31 December 2007, by the first author and an information specialist. The following combinations of keywords were used:

### PubMed

(train\*[TI] OR "Education, Continuing"[MeSH] OR "Staff Development"[MeSH] OR "Educational Measurement"[MeSH] OR "Patient Simulation"[MeSH] OR "Inservice Training"[MeSH] OR "Obstetrics/education"[MeSH] OR

"Gynecology/education"[MeSH] OR "Midwifery/education"[MeSH] OR "Delivery, Obstetric/education"[MeSH] OR "Nurse Midwives/education"[MeSH])

AND

(obstet\*[TI] OR "maternal mortality"[MeSH] OR "infant mortality"[MeSH] OR "Intensive Care Units, Neonatal"[MeSH] OR "Hospitals, Maternity"[MeSH] OR "Delivery, Obstetric"[MeSH] OR "Obstetrics"[MeSH] OR "Pregnancy"[MeSH] OR "Pregnancy Complications"[MeSH] OR "Perinatology"[MeSH] OR "Perinatal Care"[MeSH] OR "Prenatal Care"[MeSH] OR "neonatal resuscitation" OR "newborn resuscitation" OR "emergency obstetric care" OR EMOC)

AND

(Developing Countries OR "Africa"[MeSH] OR "Asia, Southeastern"[MeSH] OR "Asia, Western"[MeSH] OR "South America"[MeSH] OR "Central America"[MeSH])

### Embase + Medline

(train\*:ti OR 'continuing education'/exp OR 'education program'/exp OR 'in service training'/exp OR 'medical education'/exp OR 'outcome of education'/exp OR 'emergency services education' OR 'nursing education'/exp OR 'midwifery education'/exp OR 'nurse training'/exp)

AND

(obstet\*:ti OR 'maternal mortality'/exp OR 'infant mortality'/exp OR 'obstetric care'/exp OR 'childbirth'/exp OR 'obstetric emergency'/exp OR 'labor complication'/exp OR 'pregnancy'/exp OR 'pregnancy complication'/exp OR 'obstetrics'/exp OR 'newborn resuscitation' OR 'neonatal resuscitation' OR 'maternity ward'/exp OR 'emergency obstetric care' OR emoc)

AND

('developing country'/exp OR (developing AND countr\*) OR 'africa'/exp OR 'asia'/exp OR 'south america'/exp OR 'central america'/exp)

## **Popline**

SUBJECT: (=train\* /= education /= "staff development" /= "educational measurement" /= "patient simulation" /= "inservice training") & (=obstetrics /=pregnancy)

## **African Journals Online (<http://ajol.info/>)**

Search using google search engine: Obsteric and Training OR EmOC OR EOC

## **Selected websites**

We also searched the websites of the World Health Organisation, John Snow Inc., Averting Maternal Death and Disability and Population Council using the following strategy:

### **WHO (<http://www.who.int/en/> )**

Search: "EOC Training" ,"Training course" AND "essential obstetric care",

### **JSI (<http://www.jsi.com/JSIInternet/>)**

Search: training AND "emergency obstetric care"  
LSS

### **AMDD(<http://www.amddprogram.org/>)**

Search: training

### **Population Council (<http://www.popcouncil.com/>)**

Search: Eoc OR emoc

Lastly the authors contributed articles from their own files that were not captured in the electronic search. No restrictions were made on language or year of publication. Alternative search strategies for Pubmed and Embase were employed by the second author and a second information specialist. This did not yield any additional results. In addition, we manually searched bibliographies of selected papers and we searched selected websites and references to selected papers using Web of Science.

Selection took place on the basis of title and abstract. When there was any doubt, the full report was ordered. Only reports with training programs aimed at skilled providers as defined by WHO were selected. Therefore, reports describing medical curricula or specialist training programs were excluded. In addition, training of traditional birth attendants is outside the scope of this review. Only those reports were selected which described a training program and/or reported on its effect. Editorials, opinions and reviews were only included if they also described factual results. No restrictions on research methodology were applied.

