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## **Title Page**

### **Effectiveness of vaginal breech birth training strategies: an integrative review of the literature**

**Running title:** Breech birth training: integrative review of the literature

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## **Abstract**

### **Effectiveness of vaginal breech birth training strategies: an integrative review of the literature**

**Background:** The safety of vaginal breech birth depends on the skill of the attendant. The objective of this review was to identify, synthesise and report the findings of evaluated breech birth training strategies.

**Methods:** A systematic search of the following on-line databases: Medline, CINAHL Plus, PsychINFO, EBM Reviews/Cochrane Library, EMBASE, Maternity and Infant Care, and Pubmed, using a structured search strategy. Studies were included in the review if they evaluated the efficacy of a breech birth training programme or particular strategies, including obstetric emergency training evaluations that reported differentiated outcomes for breech. Out of 1040 original citations, 303 full-text articles were assessed for eligibility, and 17 methodologically diverse studies met the inclusion criteria. A data collection form was used to extract relevant information. Data were synthesised using an evaluation levels framework, including reaction, learning (subjective and objective assessment) and behavioural change.

**Results:** No evaluations included clinical outcome data. Improvements in self-assessed skill and confidence were not associated with improvements in objective assessments or behavioural change. Inclusion of breech birth as part of an obstetric emergencies training package without support in practice was negatively associated with subsequent attendance at vaginal breech births.

**Conclusions:** Due to the heterogeneity of the studies available, and the lack of evidence concerning neonatal or maternal outcomes, no conclusive practice recommendations can be made. However, the studies reviewed suggest that vaginal breech birth training may be enhanced by reflection, repetition and experienced clinical support in practice. Further evaluation studies should prioritise clinical outcome data.

**Keywords:** breech presentation, clinical competence, training, integrative review

Author Version

## Introduction

This review identifies and assesses the effectiveness of training programmes intended to improve the skills and knowledge of health professionals to facilitate vaginal breech birth. Approximately 3-4% (1:30) fetuses present breech at term. In the United Kingdom (UK), 2012-2013 national maternity statistics indicated 0.5% of births (1:200) were recorded as singleton vaginal breech births or breech extractions (1). While a majority of breech-presenting infants are born by caesarean section, skills to facilitate vaginal breech birth remain important and have been highlighted as a research priority by the latest Cochrane Review on term breech delivery (2). Additionally, evidence exists that more women would choose to attempt vaginal breech birth (3), but many meet resistance from health care providers who prefer a caesarean section delivery due to perceived short-term neonatal benefits (4) and a lack of skill and confidence to safely facilitate vaginal breech birth (5–7). Due to a lack of evidence of long-term benefits associated with planned caesarean section for breech presentation (2), and continuing calls to reduce caesarean rates (8–10), access to providers with expertise in facilitating vaginal breech births is an important care quality goal.

In this review, we aimed to consider the effect of available training according to 4 levels of evaluation, as described by Kirkpatrick (11), and including both intended and unintended outcomes, as recommended by Yardley and Dornan (12):

1. *Reaction*: Do participants like the training? Do they feel it is relevant and useful to their practice?
2. *Learning*: Have their attitudes changed? (level 2a) Have participants acquired

- new knowledge? Have their technical clinical skills improved? (level 2b)
3. *Behaviour*: Does the training result in the use of the skills and knowledge gained in practice?
  4. *Results*: How does the training impact society? Does it increase access to a skilled provider? (level 4a) Does it improve neonatal or maternal outcomes? (level 4b)

We also sought to gain insights on effective strategies of breech education.

## Methods

A search strategy was designed to identify relevant literature and conducted independently by the first and second authors. The initial search was completed in October 2015, with follow-up search of literature in September 2016, following consultation with the City, University of London, academic librarian. The following search engines and databases were used: CINAHL Plus, Medline, PsychINFO, EBM Reviews/Cochrane Library, EMBASE, Maternity and Infant Care, and Pubmed, in order to identify recent grey literature, such as evaluations and conference reports not distributed through commercial publishers. Key search words and Boolean operators included the phrase/MeSH term 'breech presentation' AND one of the following stem words: competence (competen\*), confidence (confiden\*), training (train\*), skill (skill\*), simulation (simulat\*), mentor (mentor\*), OR supervisor (supervis\*). A hand search of reference lists was conducted. The search was limited to literature published since 1995 with a title and abstract available to be screened in English. Following elimination of duplicates and initial screening of titles and

abstracts, a total of 303 full-text articles were retrieved. Inclusion criteria were that the article report on a vaginal breech birth training programme involving maternity care professionals. Articles were excluded due to lack of relevance to vaginal breech birth, lack of post-training outcome data, and lack of differentiated outcomes for vaginal breech birth where general obstetric emergency training was evaluated. General surveys of trainees' vaginal breech birth experience as part of obstetric specialist training were excluded. A PRISMA Flow chart of this process is provided in Figure 1 (13). Included studies were appraised for relevance and methodological rigour and relevance using a 2-point scale (higher or lower), by agreement of the authors [Table 1]. Critical Appraisal Skills Programme tools were used (14). No study was excluded on the basis of this appraisal, but it informed the subsequent analytic process.

A total of 17 studies, including 16 published papers and 1 conference report, were identified as relevant and included in this review. An attempt was made to obtain the complete study behind the conference report in order to evaluate methodological rigour; this was not provided, but the conference report contained a clear table of relevant information which was included. The studies reviewed included two randomised controlled trials (15,16), four standardised observational assessments (17–20), five self-evaluation surveys (21–25), two exploratory analyses using scenario based structured questions (26,27), two before-and-after outcomes studies (28,29), a mixed methods process evaluation with the predominate methodology being qualitative (30), and descriptive report (31). Several of the studies used more than one method of evaluation, and gathered both quantitative and qualitative data. Where evaluations of obstetric emergency training were included, only differentiated

vaginal breech birth outcomes were included in this review. Relevant data was extracted using a Microsoft® Excel programme spreadsheet independently by the first and second authors, in consultation with the other two authors. One article was identified that was written in French, and this was translated and data extracted by the second author and the French-speaking scholar acknowledged as a contributor. The findings were then synthesised in a framework based on Kirkpatrick's hierarchy (11), as described above. Due to the heterogeneity of the studies identified, no meta-analysis was possible; therefore an integrative narrative approach was used to synthesise the broad range of data and report the results of the review (32). Given the identified literature, the results are more useful to hypothesis generation, rather than hypothesis testing, so no attempt has been made to assign strength of evidence to the findings.

## **Results**

### *Types of training*

All studies included simulation-based training, with varying amounts of theoretical instruction, opportunities for repetitive practice of manual skills and facilitated reflection. Nine of the programmes evaluated included vaginal breech birth within a general obstetric emergencies course (15,21,22,24–29). Six programmes evaluated taught vaginal breech birth as an advanced clinical skill, either on its own or along with a small number of other advanced skills (16–20,23). Two programmes evaluated included one-to-one support in clinical practice as an explicit part of the training, following theoretical and practical training (30,31). The studies included in

this review are organised according to these three broad categories in *Table 1: Vaginal Breech Birth: Summary Characteristics of Included Studies*.

### *Evaluation outcomes*

The 17 studies in this review reported evaluation outcomes related to vaginal breech birth training in the following domains: reaction, learning (subjective and objective assessment) and behavioural change. None of the 17 studies reported impact data, such as changes in neonatal or maternal health outcomes associated with vaginal breech birth training.

### *Reaction*

Where reported, those attending obstetric emergencies training courses rated the breech station highly on relevance and learning value (22). Negative feedback focused mostly on courses being too 'rushed,' with not enough time at each station. While this qualitative feedback was not differentiated for breech, this theme was repeated in feedback from three evaluations of obstetric emergencies training programmes (22,26,27). Some authors observed participants demonstrating particular interest in repeatedly practising breech birth skills on mannequins, attributed to the rarity with which they encountered breech births in the delivery room (18).

### *Learning: Subjective assessment*

Five studies reported self-assessment data (16,20,21,23,24). This data was collected via pre- and post-training questionnaires, most often using Likert or rating scales to assess participants' feelings of confidence and ability to manage vaginal

breech births. Each of these studies demonstrated an immediate increase in self-assessed confidence and/or knowledge. However, this effect eroded within 72 hours (16) or 6 weeks (24) in two of the studies. The largest and most sustained increases in self-assessed skill and confidence were observed in training programmes offering multiple opportunities to practice simulated skills throughout the year (20,23). Only one study compared different methods of training (16). In their RCT, Buerkle et al reported significantly increased confidence immediately following 30 minutes of hands-on training for European medical students, compared to a 30 minute lecture/demonstration; however, when assessed again at 72 hours, there was no significant difference between the two training groups. There was no difference between the groups at any point in self-assessed performance. Given the previously reported reaction feedback that participants often felt 'rushed' during short training stations, it may be that 30 minutes is too short a time to affect lasting change in learning-related outcomes for vaginal breech birth.

*Learning: Objective assessment*

Eight studies reported outcomes related to objective assessments of skill and/or knowledge (15–20,26,27). Change in knowledge was assessed using scenario-related or multiple choice questions. Improvement in technical skill was assessed using objective structured observations of performance in simulated scenarios. Three studies demonstrated no improvement in objectively assessed learning (15,20,27), including one in which participants had reported a sustained increase in confidence to manage a breech delivery (20). In each of these, breech delivery was included as part of an obstetrics emergency course featuring multiple different skills. Two evaluations demonstrated improvement that eroded within a short period of time

or was minimal compared to other topics on the training programme (16,26). Three studies demonstrated significant and sustained improvement in objectively assessed learning (17–19). In each of the three demonstrating significant objective improvement, vaginal breech birth training was delivered either on its own or as part of a training package including only a few obstetric/midwifery skills, each of which provided multiple opportunities for reflection on performance and repetition. This again suggests that effective vaginal breech birth training benefits from an unhurried atmosphere and planned reinforcement of learning. Two studies compared different types of training. Buerkle et al's trial demonstrated improved immediate outcomes when hands-on training was compared to a lecture/demonstration, but as with the self-assessed learning outcomes, the differences diminished by 72 hours at the training (16). Crofts et al's randomised controlled trial compared obstetric emergencies training conducted in simulation centres and local hospitals, and with the inclusion of teamwork training (15). Neither location nor the use of teamwork training had an effect on the multiple choice question-assessed knowledge scores, and breech was the only component of the training which showed no significant difference between pre- and post-training scores.

### *Behavioural change*

Seven studies reported data related to behaviour change in practice (21,23,26,28–31). Quantitative data indicated a nil or inverse relationship between participation in obstetric emergencies training programmes containing vaginal breech birth and performance of vaginal breech birth in subsequent practice (21,23,28,29). This included two studies in which participants reported a sustained increase in comfort with vaginal breech birth skills following training, but with no associated change in

vaginal breech births attended in practice (21,23). Although the headline result of Maouris et al's evaluation of interactive, hands-on training of obstetric emergencies in Western Australia was a reduction in the overall caesarean section rate, subgroup analysis of vaginal breech births as a percentage of all births declined from 1.15% pre-training to 0.4% post-training due to a marked increase in caesarean section for breech (28). Three studies reported qualitative data indicating participants were using the breech skills learnt in clinical practice (22,30,31). In Ellard et al's evaluation of an extended training package for non-physician clinicians in obstetric emergencies and newborn care, which included one-to-one clinical support following theoretical and simulation training, participants reported using specific vaginal breech birth skills learnt in clinical practice. 'Several' trainees reported cascading the training to other health care workers and a belief that the vaginal breech birth training had reduced the use of caesarean section for breech (30). Similarly, in Dolo et al's descriptive report, the two midwives enrolled on an obstetric clinician training programme, which included an apprenticeship with support in clinical practice, attended 21 vaginal breech births in the 18 months included in the evaluation (31).

## **Discussion**

The available evidence does not answer the questions of how the safety of vaginal breech birth can be improved, or how access to a skilled provider can be increased. However, time for reflection and repetition, and clinical support in practice appear to enhance the training outcomes evaluated. Reaction data indicated participants valued and were motivated to participate in vaginal breech birth simulation training, but multiple obstetric emergencies courses reported participants felt 'rushed.' In all of

the studies where self-assessment data demonstrated initial increases in comfort, confidence and/or knowledge, for most, this difference had declined significantly in follow-up studies, and even sustained increases in confidence were associated with no change in objectively assessed skill and/or no increased likelihood of performing vaginal breech birth in practice. The objective assessment data revealed no improvement in performance and/or knowledge when vaginal breech birth was taught as part of obstetric emergencies training packages, but did suggest some improvement when vaginal breech birth was taught on its own or with a small number of obstetric/midwifery skills, as part of training strategies that incorporated more repetition and reflection. Behavioural change data indicated a nil or inverse relationship between participation in obstetrics emergency training programmes and subsequent attendance at vaginal breech births in practice, unless this was augmented by support in clinical practice.

The strength of this review is the use of both qualitative and quantitative data from several different vaginal breech birth training packages to provide insight into why some models of vaginal breech birth training appear to affect more lasting or significant change than others, and to suggest avenues for future research. The major limitation is that, due to the wide disparity among the studies, no conclusions can be drawn to recommend changes in practice. Another limitation is that, due to outcome reporting bias, other relevant studies may have been missed (33). The initial database searches resulted in the inclusion of nine studies, and the remaining eight references were included after conducting a thorough hand-search of all reference lists. The eight that were added all evaluated general obstetric emergencies courses, and most reported negative or eroding results in the vaginal

breech birth category. They were likely not retrieved in the initial search because other more successful results were indexed in the reporting, for example significant changes in shoulder dystocia or postpartum haemorrhage management.

The strongest evidence for training programmes is data demonstrating an impact on neonatal and/or maternal outcomes associated with the implementation of the training. The one study included in this review that did link training to a reduction in Apgar scores <7 also demonstrated a very large reduction in the number of breech-presenting babies actually born vaginally during the same period, and therefore provides no evidence that performance of vaginal breech delivery itself actually improved (28). Similarly, a UK-based study of an obstetric emergencies course reported an improvement in neonatal outcomes following training, but breech presentations were excluded from the analysis (34). The report does not clarify why outcome data for breech-presenting infants was excluded in an evaluation of a course that includes vaginal breech birth training.

The lack of association between sustained or increased levels of confidence and the domains of objective assessment or behavioural change demonstrated in these studies, suggests that at best self-assessment as an evaluation feature has limited usefulness, and at worst may introduce false confidence. This finding aligns with the results of a systematic review indicating lack of accuracy of physician self-assessment compared with observed measures of competence (35). However, improvement in objectively assessed simulated performance and knowledge is also only useful if the change in performance actually results in an improvement in safety; rigid adherence to a rote set of behavioural procedures could potentially limit

problem-solving ability in complex scenarios (36). Without data linking subjective or objective assessments to neonatal outcomes, it is impossible to know for sure which if either will influence safety outcomes. Future training evaluations should strive to include safety data.

Training may also be enhanced by co-ordination with specific strategies to ensure experienced clinical supervision. In one of two studies in this review including one-to-one support to implement training in clinical practice, participants subjectively reported decreased use of caesarean section for breech and increased ability to manage vaginal breech births in practice (30), and in the other they reported attending a significant number of VBBs in the 18 months post-training (31). In their review of factors associated with adverse clinical outcomes among obstetrics trainees, Aiken et al recommended undertaking more directly supervised procedures may reduce adverse outcomes (37). Gannard-Penchin et al reported excellent neonatal outcomes where over 60% of vaginal breech births were managed by trainees under direct supervision, in a unit where specific training in vaginal breech birth is offered to all trainees (38).

It may seem obvious that clinical supervision by experienced mentors would enhance training, but in the UK, for example, a recent study found only 66% of trainees who had attended vaginal breech births had received supervision in practice (39), and as recently as 2015 a UK coroner wrote to the Chief Medical Officer to emphasise the importance of having a consultant present at all breech deliveries (40). This suggests adequate clinical supervision strategies are not universally in place, perhaps because not all obstetric consultants are confident to supervise

vaginal breech births (41). It may also be that trainees passing objective structured assessments of simulated performance have been deemed 'competent' to facilitate vaginal breech birth, and are therefore perceived as not requiring continued supervision. The results of this review suggest it would be worthwhile to evaluate training that specifically includes a strategy to provide clinical supervision by identified vaginal breech birth specialists (eg. professionals who attend at least 3-6 vaginal breech births per year) (42) in a setting with a low average perinatal mortality rate. Maier et al and García Adánez et al have demonstrated on-call arrangements can achieve good neonatal outcomes while facilitating women's vaginal breech birth choices (43,44).

Finally, although many of the studies reviewed included midwives in the training and evaluation, all of the studies and training packages were led by obstetricians. McKenna et al, in their review of midwifery educational leaders on the use of simulation in midwifery education, noted a need to develop approaches that reflect midwifery care provision in the context of a woman-centred, holistic approach to care (45). Greater interdisciplinary input, especially from midwives and the women who use maternity services, alongside obstetric expertise, will be required to develop and evaluate training packages including vaginal breech birth skills within a paradigm of complex normality (46).

## **Conclusion**

This review highlights the paucity of evidence supporting current strategies of vaginal breech birth skills training, none of which have been thoroughly evaluated to determine their effect on clinical outcomes. No research was identified correlating a

specific vaginal breech birth training programme with neonatal or maternal outcome data, and this is a research priority. Centres reporting outcome data related to vaginal breech birth should report training and competence assessment strategies as well as practice parameters. The currently available research suggests directions of potentially fruitful enquiry, rather than strong practice recommendations. However, the review calls into question the evidence base for providing vaginal breech birth skills training via general obstetrics emergencies courses. The most successful objective results were seen in training programmes focusing on vaginal breech birth alone or with a small number of other advanced obstetric/midwifery skills. In order to support women's informed choice of vaginal birth, breech training may benefit from programmes that provide time for reflection, repetition and self-directed practice of manual skills. One-to-one support in clinical practice from someone who attends vaginal breech births regularly appears to enhance trainees' and professionals' confidence to actually attend vaginal breech births.

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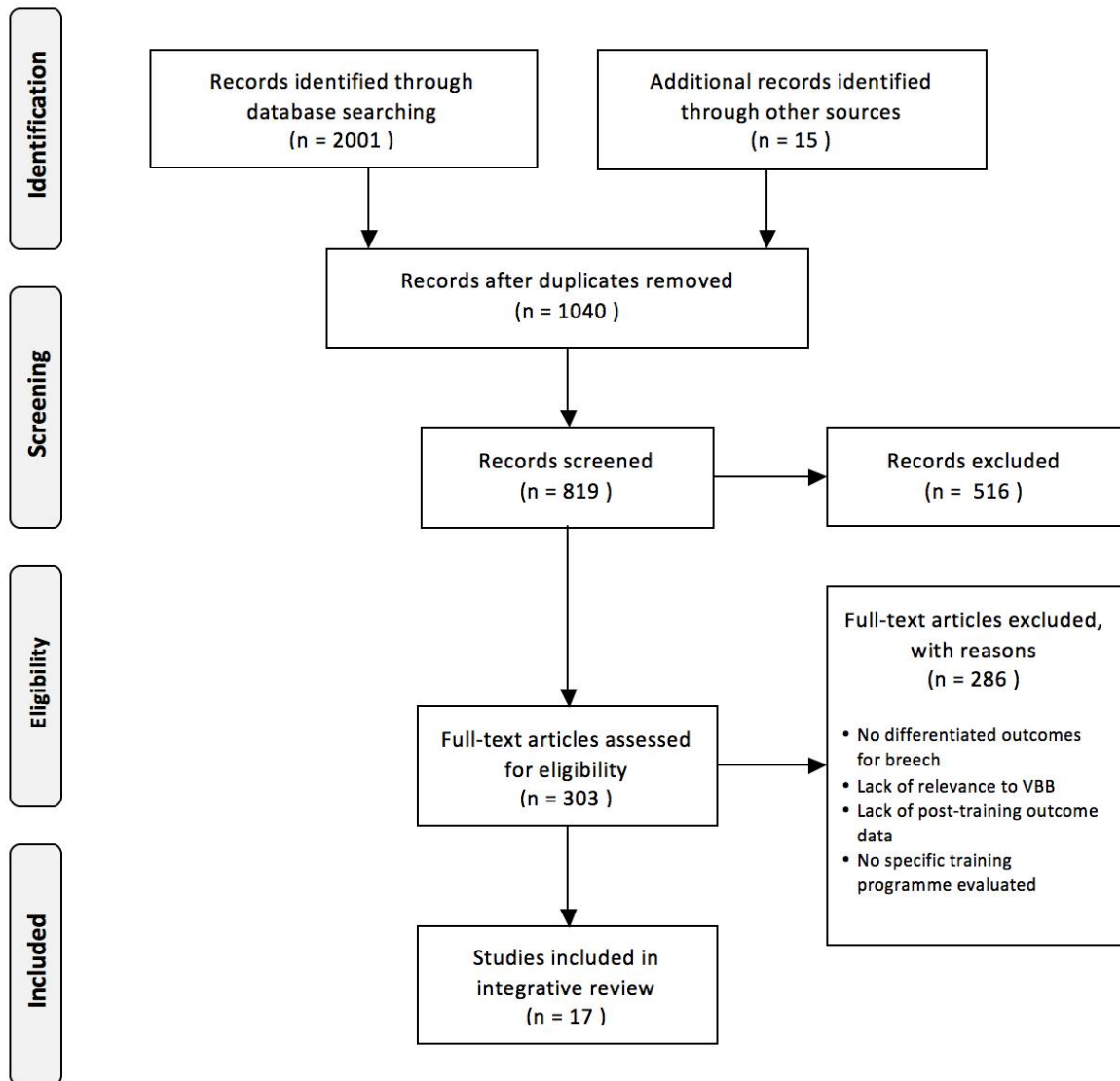
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**Table 1. Vaginal Breech Birth Training: Summary Characteristics of Included Studies**

Author / Date / Setting	Training / Sample	Methods / Rigour / Relevance	Results
<b>General obstetric emergencies courses</b>			
Crofts et al, 2007, UK	Obstetric emergencies training; 1 or 2 day courses +/- teamwork training. 140 doctors and midwives, junior and senior	RCT; multiple choice questionnaire Rigour 1 / Relevance 1	Breech only component that showed no significant improvement
Evensen et al, 2015, Ethiopia	Obstetrics emergencies courses, 1-2 days or 2-3 days. 111 health care workers (doctors, midwives, paramedics)	Validated Likert scale survey of self-assessed confidence pre-, post- and 6 months after training Rigour 2 / Relevance 1	Immediate post-course increase in confidence; by 6 months breech was only station with no difference to pre-course scores
Johanson et al, 1999, UK	Obstetric emergencies training, 2 days theory and simulated practice. 30 specialty trainees in obstetrics	Post-training survey; rating scale on relevance and learning value; free text Rigour 2 / Relevance 1	Considered relevant (9.6/10), with learning value (8.9/10); 2/19 free text answers indicated performing VBB better in practice
Johanson et al, 2002, Armenia	Obstetric emergencies training, 2 days theory and simulated practice. 8 obstetricians	Composite score: scenario-based structured questions, objective assessment of simulated performance by instructor Rigour 2 / Relevance 1	Breech one of only two scenarios that did not demonstrate improvement
Johanson et al, 2002, Bangladesh	Obstetric emergencies training, 2 days theory and simulated practice. 9 obstetric staff (3 consultants, 2 registrars, 4 medical officers)	Composite score: scenario-based structured questions, objective assessment of simulated performance by instructor Rigour 2 / Relevance 1	Minor improvement in breech, compared to other stations, at least one candidate performed worse following training
Maouris et al, 2010, Western Australia	Obstetric emergencies training, 1 day. Each of 14 rural and remote hospitals in WA, small teams of 4-8	Retrospective analysis of pre-training and post-training outcomes Rigour 2 / Relevance 1	Vaginal breech birth rate declined from 1.15% to 0.45% of total birth rate (statistically significant)
Spitzer et al, 2014, Kenya	5-day obstetric emergencies course. 80% of hospital staff received training	Prospective analysis of pre-training and post-training outcomes Rigour 2 / Relevance 1	Non-significant decline in vaginal breech births as % of total birth rate
Taylor & Kiser, 1998, USA	Obstetric emergencies course. 275 doctors and midwives	Self-assessed comfort, performance in practice Rigour 2 / Relevance 1	Increase in comfort between pre-training and 1 year post-training; no change in % attending vaginal breech in practice
Walker et al, 2013, Australia	Obstetric emergencies course. 165 midwives and doctors	Prospective repeated measures survey, pre-, post- and 6 months after training Rigour 2 / Relevance 1	Increase in self-assessed knowledge and confidence; levels declined by 6 weeks, including all 3 measures related to breech
<b>Vaginal breech as an advanced clinical skill</b>			
Buerkle et al, 2013, Germany	30 min demonstration or 30 min hands-on training. 172 medical students	RCT; OSATS scores, self-assessment, global rating, performance time Rigour 1 / Relevance 2	Short-term evaluation outcomes improved with hands-on training; no difference at 72 hrs
Deering et al,	Impromptu simulated	Standardised objective	Improvement in 8/12 key skill

2006, USA	scenario, videotaped, training, discussion; repeated 2 weeks later; breech only skill taught. 20 residents in 2 obstetrics & gynaecology training programmes	assessment, blinded to training status Rigour 2 / Relevance 1	components; Improvement in objectively assessed performance and safety
Jordan et al, 2015, France	1 day simulation course, cephalic and breech delivery, theory, assessed simulated performance; taught alongside 2 gynae surgery skills. 20 residents (17 in OB/GYN, 3 in medical gynecology)	Simulation assessed by senior resident, 3 months apart Rigour 2 / Relevance 1	Score improved between sessions; participants felt feeling of progress after 1 <sup>st</sup> and 2 <sup>nd</sup> sessions; 3/20 felt confident to facilitate breech; Liked hands-on breech practice
Locksmith et al, 2001, USA	Training including routine use of Laue-Piper forceps at caesarean section. 43 trainees from study centre and 89 controls	Survey of self-assessed comfort and skill with LPF, experience with forceps for breech, likelihood of attending a breech in practice Rigour 2 / Relevance 2	Self-assessed comfort and skill increased; no affect on level of experience of forceps for breech, or likelihood of attending vaginal breech birth in practice
Noblot et al, 2015, France	1 day course in complicated breech and shoulder dystocia (3 hrs each). 250 doctors, midwives & nursery nurses in small groups of 2-3	Video-taped simulation performance assessed on pre-established grid (score/100) Rigour 2 / Relevance 1	Significant overall improvement, especially domains of know-how, technique, communication with patient, safety
Thornburg et al, 2014, USA	Periodic lectures and simulation training in rarely observed and used obstetrical skills; end of year assessment. 21 obstetric residents	Identification and knowledge based questions; simulation judged by single observer Rigour 2 / Relevance 1	Significant increase in self-assessed knowledge over 1 year; no change in objectively assessed knowledge
<b>Training programmes featuring an explicit 'support in clinical practice' component</b>			
Dolo et al, 2016, Liberia	2-year apprenticeship training programme in obstetric procedures, combining theory and practice. 2 midwives	Descriptive report; number of vaginal breech births attended in 18-month apprenticeship period following theoretical training Rigour 2 / Relevance 1	21 vaginal breech births managed by 2 midwives in 18-month period
Ellard et al, 2014, Malawi	Obstetric emergencies training; additional 1:1 clinical support, leadership training. 54 non-physician clinicians	Mixed methods process evaluation; predominately qualitative Rigour 2 / Relevance 1	Thematic analysis of interviews included reports of improved VBB practice (2/39), cascading learning, reduced CS for breech

*Rigour and relevance were assessed on a 2-point scale by agreement of the authors following critical appraisal. Rigour pertains to the design of the evaluation and the strength of the evidence it is able to provide. Relevance pertains to the study's applicability to the design of training for qualified obstetricians and midwives. No study was eliminated on the basis of this appraisal, but it informed the analytic process.*



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