

BEME protocol

A systematic review of course evaluation methods of teaching and outcomes for continuing professional development within low and lower-middle income countries: The case of paediatric and neonatal acute-care short courses

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Sources of support

None

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Aim

The aim of this review is to establish the different evaluation methods already used in literature and to discuss their differing benefits and limitations. This will be of use to guide educators from both high-income countries and LLMIC in course design and evaluation. There is considerable investment in these postgraduate courses and evidence is required that these resources are being put to best use. Outcome measures displaying significant and in particular long-term improvements can be used to promote these short courses and present them to future funders and policy-makers in LLMIC to encourage more widespread use and impact on lives.

Background to the topic

Global Inequalities

Health inequalities across the globe, highlighted by differences in child and neonatal mortality between different countries(1), have motivated many to act. In low and lower-middle income countries (LLMIC), children often present later in their stage of illness and a high proportion die early on in their admission to hospital(2). Poor availability of essential medicines can contribute to this burden(3, 4). Without a skilled birth attendant, many newborns do not survive the first day of life. Neonatal mortality now encompasses 45% of all deaths in children under five years of age(5).

It is known that differences in the density of healthcare workers is an important contributor to the inequalities of infant and under-five mortality between (and within) countries(6). In 2014, the percentage of births attended by a skilled attendant was 98.5% in the USA and 20.2% in Chad(7). The situation is projected to worsen, with a shortfall of 18 million health workers globally by 2030, predominantly in LLMIC(8).

The World Health Organization's 'World Health Report' in 2006(9) stated that "lifelong learning... includ[ing] short-term training" of existing healthcare workers was a key instrument in addressing this problem. Of 115 neonatal resuscitations by 55 nurses/midwives in a Kenyan hospital, only 10% showed perfect and 27% adequate initial resuscitation steps pre-course(10). In a study across 21 different LLMIC, 100 of 113 (76%) of paediatric patients had an adverse factor in their acute hospital care, such as inappropriate triage or treatment(11). These suggest current pre-service training requires complementation by postgraduate education. Training in neonatal or paediatric resuscitation as well as acute life-saving treatment for the most common and reversible illnesses should improve outcomes during the first 24 hours of hospital admission and overall mortality. Clinicians from various international settings, most effectively in collaboration with local healthcare workers, have started to put in place short-term continuing professional development (CPD) programmes in LLMIC aiming to improve the inequalities that exist around the world.

Evaluation Models

How is it possible to know if these programmes have any short or long term impact on the population they are designed to serve? Is any reasoning given by educators for the pedagogy, content or resources required for the course? Are these similar across different education providers or geographical locations? 'Educational meetings' are under the 'Implementation Strategies' domain of the Effective Practice and Organisation of Care (EPOC) Taxonomy of health system intervention reviews(12). Two main components of educational meeting evaluation, according to Newble and Cannon(13), are evaluations of both the course itself and of the course's outcomes or 'effectiveness'. This review will use a two-step analysis of each paediatric acute care course based in a LLMIC that has undertaken both these aspects of evaluation.

Shufflebeam's "Context, Input, Process and Product evaluation" (CIPP) model(14) is an evidence-based method of evaluating all complex and dynamic phases of an educational programme including design, implementation and assessment(15). The teaching methods, course content and resources used by the educators should be justified by an evaluation of the context of the course, thereby not only describing *how* but also *why* a course was performed(16). It is important that the course content and delivery was made applicable to the low resource setting. For example, the content should be relevant to the diagnostic capability, equipment and treatments available in the target setting. With regards to delivery, the limited availability of human resources should be appreciated and catered to accordingly so the course is sustainable. Evaluating the 'process' of the course can be shown by the authors' justification of any changes or adjustments made after the course had begun. In this way, the educators' *justification* of teaching methods, content, resources or course adjustments can be used as an insight into the evaluation which occurred of the course itself.

The Kirkpatrick framework is a well-established educational theory which measures a course's effectiveness by way of outcome evaluation. This can be adapted for use with postgraduate medical courses by determining the following four levels as outcomes of effectiveness: reaction (participants' satisfaction), learning (change in knowledge or skills), behaviour (change in clinical practice) and results (change in outcomes such as morbidity and mortality).

It is apparent that as one progresses through these four levels they can become more difficult and time-consuming to measure, although these levels cannot be thought of as hierarchical. It is relatively straightforward to design questionnaires for immediate post-course completion. These can give information on both individual course components but also *satisfaction* with the syllabus and perceived fulfilment of learning objectives. Assessing knowledge or skills gained is usually done by a pre- and post-course assessment. However, one can argue that these improvements may not be retained for any meaningful length of time or be translated into a change in practice.

Measuring a *change in knowledge* after participants have left the course is difficult to formally test in non-examination conditions. Therefore, measuring a change of behaviour which is sustained weeks or months after the course is completed may be more useful and more closely correlated with health outcomes. Data on changed clinical practise can include videotaped resuscitation analysis or self-reflection logbooks. Post-course qualitative interviewing is an increasingly used method. Change in knowledge alone cannot be the only solution. A lack of resources such as medicines or technology potentially eliminates any opportunity for change, but a course may be able to promote agile thinking and resourcefulness in its participants. For example, a status epilepticus protocol may be adapted to include the particular benzodiazepine which is readily available locally. Alternatively, displaying a change in availability of emergency medication after a course suggests participants were motivated to change not only their own clinical practice but also the health infrastructure around them.

If a course can obtain evidence of *changed trainee behaviour* such as appropriately prescribed antimalarials in severe malaria(17) or time to first benzodiazepine in status

epilepticus, this is of great importance. Some educators may be able to demonstrate *health-outcome improvements* such as in child or neonatal morbidity or mortality following their course(18), either as a direct result of the training or indirectly by participant-led quality improvement projects.

Previous reviews

Van Lonkhuijzen, L. (2010) A systematic review of the effectiveness of training in emergency obstetric care in low-resource environments.

BJOG **117**:777–787.

This paper reviewed the effectiveness of obstetric emergency courses including both short and longer courses up to eight weeks. Using the Kirkpatrick framework they conclude that trainees' feedback and knowledge was much more frequently measured than clinical practice or health outcomes.

Tian, J (2007) A systematic review of evaluation in formal continuing medical education.

J Contin Educ Health Prof. **27**(1):16-27.

This review encompasses all forms of postgraduate medical educational interventions which had evaluated outcomes in level two to four of the Kirkpatrick model. However, only Randomised Controlled Studies or quasi-experimental trials with a control arm were included. It describes the varying evaluation instruments used and concludes that evaluation beyond participant satisfaction was not often done. Self-developed evaluation instruments had often not undergone reliability and validity testing. Our review has a more specific context and therefore can be more descriptive about the educational intervention and include all types of study design.

Primary research question:

What evaluation methods of teaching and outcomes are used in low and lower-middle income countries (LLMIC) for paediatric and neonatal acute care continuing professional development short courses?

Secondary:

What physical resources are used in the course and in the outcome evaluation methods?

- (This includes educational resources such as laptops, projectors, rooms etc as well as resources for measuring outcomes such as postal surveys, logbooks etc)

What justification is given for the chosen evaluation methods?

What facilitating and limiting factors are described when implementing these evaluation methods?

Where have the authors evaluated the Context, Input, Process and Product of the course (CIPP framework)?

Which Kirkpatrick level(s) do the outcome measures correspond to?

Key words:

- Paediatric
- Neonatal
- Children
- Emergency
- Acute
- Resuscitation
- Low income
- Low resource
- Resource poor
- Developing country
- Outcome
- Evaluation

Search sources and strategies

Databases:

OVID Medline

OVID Embase

ERIC – educational database

CINAHL

Web of Science

Scopus

Cochrane

African Index Medicus

Index Medicus for the Eastern Mediterranean Region

IndMED (India)

LILACS (Latin America and the Caribbean)

IMSEAR (Index Medicus for the South-East Asia Region)

WPRIM (Western Pacific Region Index Medicus)

Clinical trials registries:

<https://clinicaltrials.gov>

WHO International Clinical Trials Registry Platform (ICTRP, <http://www.who.int/ictrp/en/>)

Contact ALSG, ETAT, Helping Babies Breathe, Integrated Management of Neonatal and Childhood Illness (IMNCI) training for additional papers

Reference lists of influential studies will be checked for additional papers.

Search Strategy

1. exp Adolescent/ or exp Child, Preschool/ or exp Infant/ or exp Child/ or exp Pediatrics/ or p?ediatr*.mp.
2. Infant, Newborn/ or Neonatal Nursing/ or Neonatology/ or neonat*.mp.
3. child*.mp.
4. 1 or 2 or 3
5. exp Emergency Medical Services/ or exp Emergency Service, Hospital/ or exp Emergencies/ or exp Emergency Medicine/ or emergenc*.mp.
6. exp Acute Disease/ or acute.mp.
7. exp Resuscitation/ or resus*.mp.
8. 5 or 6 or 7
9. 4 and 8
10. (developing and countr*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
11. exp Developing Countries/
12. "low income".mp.
13. "middle income".mp
14. "low resource".mp.
15. "resource poor".mp.
16. 10 or 11 or 12 or 13 or 14 or 15
17. 9 and 16
18. exp Education, Nursing, Associate/ or exp Education, Pharmacy, Graduate/ or exp Education, Nursing/ or exp Education, Public Health Professional/ or exp Education/ or exp Education, Continuing/ or exp Education, Pharmacy/ or exp Nursing Education Research/ or exp Education, Professional/ or exp Education, Medical, Graduate/ or exp Education, Graduate/ or exp Education, Nursing, Continuing/ or exp Education, Professional, Retraining/ or exp Health Education/ or exp Education, Medical/ or "education".mp. or exp Education, Pharmacy, Continuing/ or exp Education, Nursing, Graduate/ or exp Vocational Education/ or exp Education, Medical, Continuing/
19. training.mp.
20. course.mp.
21. 18 or 19 or 20
22. 17 and 21
23. exp "Outcome Assessment (Health Care)"/ or outcome.mp.
24. exp Evaluation Studies as Topic/ or evaluation.mp.
25. 23 or 24
26. 22 and 25

Inclusion Criteria

Population:

Participant is any postgraduate/high level healthcare provider: physician, nurse, nurse practitioner, midwife, clinical officer

Intervention:

Face-to-face paediatric or neonatal acute/emergency care course
Course lasting one week (7 days) or less

Context:

Low income or lower-middle income country

Outcome:

Evaluation of course teaching methods and resources
Evaluation of course outcomes

No language restrictions

Exclusion Criteria: Review articles

Data Extraction

Two reviewers will independently screen the titles and abstracts of all articles in search against the inclusion criteria:

If both agree the article should be included then the full paper will be sought.

If both agree the article should not be included then the article is excluded.

If the reviewers do not agree the full paper will be sought and the article included in the following stage.

Two reviewers will independently read the full article and verify the inclusion criteria are met. A kappa statistic will determine the level of agreement.

Disagreements will be discussed with a third reviewer and a consensus will be reached.

A data extraction form for all included articles will be completed independently by two reviewers and disagreements discussed with a third reviewer for a consensus.

If data is incomplete from an eligible paper, the authors should be contacted for additional information.

Reference managing software will be used to store and manage references.

Foreign language papers

Colleagues of the review team members within their NHS Health Boards and universities will first be sought for translation. If this is not possible, translators affiliated with the University of Dundee will be sought.

Definitions:

- Low income and lower-middle income country as defined by World Bank
- Continuing professional development: “the process by which health professionals keep updated to meet the needs of patients, the health service, and their own professional development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice.” (19)
- Acute/emergency care: The care of a neonate or child (up to 16th birthday) within the first 24 hours of healthcare attendance.

Scoping Search

A scoping search was performed using Medline OVID with the above search criteria and inclusion/exclusion criteria on 7th Dec 2017. A total of 941 papers were found in the search. After reading the titles and abstracts, 56 papers were considered eligible for full text analysis.

Quality assessment

No article will be excluded based on study design except review articles.

We will not weight studies based on quality scores.

The following tables shall be used for quality assessment of:

1. The post graduate educational intervention described adapted from Kern’s framework(20) then
2. The study quality by Medical Education Research Study Quality Instrument (MERSQI) tool(21)

Bias source	Low risk of bias	Unclear risk of bias	High risk of bias
<i>Problem identification</i> Educational underpinning (rational for course).	Clear and relevant description of theoretical models or conceptual frameworks that underpin the healthcare problem to be addressed.	Some limited discussion of underpinning, with minimal interpretation in the context of the study	No mention of underpinning
<i>Needs of learners</i> The setting.	Clear details of the educational context and learner characteristics of the study	Some description, but not significant as to support dissemination	No details of learner characteristics or setting
<i>Goals and objectives</i> in the curriculum	Clear description of the goals and learning objectives of the curriculum/syllabus	Some limited description	No mention of goals or learning objectives.
<i>Educational strategies.</i> Curriculum	Clear description of content and methods of teaching that are easily reproducible.	Some limited description that is not easily reproducible.	No mention of curriculum.

<i>Implementation</i> Pedagogical (method of teaching eg task-based) and <i>resources</i> used	Clear description of relevant pedagogy employed to support delivery and of <i>resources</i> required.	Some pedagogical alignment & <i>resources</i> mentioned but limited detail	No details of pedagogy or <i>resources</i>
Content	Provision of detailed materials (or details of access)	Some elements of materials presented or summary information	No educational content presented
Conclusion	Conclusions of the study reflect the findings	Some mismatch between the conclusions and findings	No correlation between the findings and conclusions

Study design	Single-group cross-sectional or single-group posttest only	1
	Single-group pretest and posttest	1.5
	Nonrandomized, 2 group	2
	Randomised controlled trial	3
Sampling: Institutions	1 institution	0.5
	2 institutions	1
	3 or more institutions	1.5
Sampling: response rate <i>Please score for each sampling response eg post- test & 6-month survey</i>	Not applicable	n/a
	<50% or not reported	0.5
	50-74%	1
	>=75%	1.5
Type of data	Assessment by study participant	0
	Objective eg <i>audit, prescriptions</i>	1
Validity evidence for evaluation scores (choose all that apply)	Not applicable	n/a
	Content	1
	Internal structure	1
	Relationship to other variables	1
Data analysis: sophistication	Descriptive analysis only	1
	Beyond descriptive analysis	2
Data analysis: appropriate	Data analysis appropriate for study design and type of data	1
Outcome (Kirkpatrick level)	Satisfaction, attitudes, perceptions, opinions, general facts	1
	Knowledge, skills	1.5
	Behaviours	2
	Patient/healthcare outcome	3

Synthesis of extracted evidence

A narrative synthesis will be performed to draw conclusions from the full range of relevant literature found which are easily applicable to educators wishing to provide paediatric acute care courses in LLMIC.

The table below shall be used for the extracted data of course and outcome evaluation frameworks for each eligible study. The data for each step shall then be integrated from across the literature and presented in a synthesized conclusion so that the range of methods for each step of the evaluation process is understood by the readers. Authors' justification for their evaluation method(s) as well as details about resources required will be included in this discussion.

Study (Lead author, publication date, country)	Evaluation method(s) used (Only include relevant method(s))		Description	??Justification for chosen evaluation method
	CIPP framework	Context		
		Input		
		Process		
		(Product)		
	Kirkpatrick framework	Level 1: Participants' satisfaction		
		Level 2: Change in knowledge or skills		
		Level 3: Change in behaviour		
		Level 4: Health outcome changes		

It is anticipated that much of the literature will be focused on what is more straightforward to evaluate: levels one and two of the Kirkpatrick framework. Although these are of course important, examples of innovative and resourceful methods of measuring changes in behaviour over time or healthcare improvements will be given their due focus in order to disseminate these techniques for the benefit of all.

Translation into practise

The ultimate aim of paediatric and neonatal emergency courses is to have a positive impact on the care delivered to the local population. To achieve this goal requires a well-designed evaluation of the training provided and subsequent refinement of the course based on the findings.

This review will provide a detailed description of the current landscape of evaluation methods of postgraduate courses in LLMIC. Course evaluation can be difficult, especially in a LLMIC with stretched resources. By explaining evaluation methods of course content, delivery and outcome measures based on a CIPP and Kirkpatrick theories, this review will provide important information of evidence-based design and implementation of course evaluation. The results of this BEME review will be summarised into a one-page guidance on how to plan a strong evaluation available to course developers in low-resource settings. This, in turn, will enable educators to create short courses with the maximum lasting impact.

Project timetable

Month 2018	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Full literature searches, removal of duplicates and review articles	*	*										
Initial screening of titles and abstracts			*	*								
Coding of full eligible articles				*	*							
Quality assessment and data extraction					*	*	*	*	*			
Data synthesis and review writing								*	*	*	*	
Finalising report												*

Conflict of interest

Dr Morris Gordon is Chair of BEME Editorial Committee.

There are no conflicts of interest, including any financial conflicts.

Plans for updating the review

This is a topical and evolving field as more providers are interested in courses in LLMIC. Therefore, in five years' time this team will update the review with any new literature which adds to the repertoire of course evaluation techniques in order that the most up-to-date information is available to all.

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