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Review

The train the trainer model for the propagation of resuscitation knowledge in limited resource settings: A systematic review☆

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ABSTRACT

Background: The Train the Trainer (TTT) model is increasingly used in limited resource settings as a mechanism to disseminate resuscitation knowledge and skills among providers. Anecdotally, however, many resuscitation programs that use this model fail to achieve sustainability.

Objective: We aim to systematically review the literature to describe the evidence for the TTT method of knowledge dissemination for resuscitation courses in limited resource settings.

Methods: We conducted a systematic review of the literature in accordance with PRISMA guidelines of the PubMed, Cochrane Library, MEDLARS online (MEDLINE), and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases.

Results: Eleven manuscripts met inclusion criteria, the majority (7/11) focused on neonatal resuscitation. We found strong evidence for the TTT model for imparting knowledge and skills on providers, however, little evidence exists for the impact of these programs on patient outcomes or long term sustainability. Facilitators associated with successful programming include the use of language and resource appropriate materials, support from the Ministry of Health of the country, and economic support for supplies and salaries.

Conclusion: While the TTT model of programming for the dissemination of resuscitation education is promising, further research is necessary especially relating to sustainability and impact on patient outcomes. Familiarity with the local environment, language, culture, resources and economic realities prior to the initiation of programming is key to success.

Background

Globally, a disproportionate share of the burden of premature death comes from Low and Middle Income Countries (LMICs) with limited resources for healthcare [1]. In these settings, training for the provision of acute care is often neglected in favor of prevention initiatives and primary care. To decrease the burden of premature death, however, acute care systems must also be developed [2]. Resuscitation efforts are attempted by providers in limited resource settings, often despite insufficient prior training [3]. Standardized resuscitation training programs, widely available in high resource environments, are shown to improve patient outcomes [4]. In limited resource settings, however, the cost of U.S. and European resuscitation courses is a barrier [5]. Further, active exportation and advertising of U.S. and European training programs have historically discouraged medical communities in resource limited settings from developing their own programs [5]. Thus, very few providers have access to this valuable education.

In 2010, Meaney et al reviewed the evidence and concluded that resuscitation training programs are feasible in limited resource settings [6]. Increasingly, groups from high resource settings travel to limited resource settings to give brief training programs on resuscitation topics [7]. Among NGOs and universities, the preferred method of information dissemination has become the “train the trainer” (TTT) method. With this model, the typical scenario is that a group from a high resource setting gives an initial training course and then develops select participants from the limited resource setting into instructors who are expected to perpetuate the trainings to educate their colleagues. The TTT method is espoused as a mechanism to leverage limited resources and create sustainability [8]. TTT programs have the potential to self-perpetuate and subsequently disseminate knowledge on the country level. Anecdotally, however, many question the utility of TTT programs as they often end prematurely and fail to achieve sustainability. As these programs increase in popularity, it is important to understand the total body of evidence for the TTT model in resuscitation education in

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limited resource settings and to understand which program characteristics facilitate long-term sustainability.

Objective

The objective of this study is to systematically review the evidence for the "Train the Trainer" method of knowledge dissemination for resuscitation courses in limited resources settings.

Methods

We performed a systematic review of the literature that was planned, conducted, and reported in adherence to PRISMA standards for the quality for reporting systematic reviews [9]. The research questions, definition of terms, outcomes and analyses were specified *a priori*. We aimed to answer the following PICO question (Patient/Population, Intervention, Comparator, Outcome) [10]: "In resuscitation education in limited resource settings (P), does the train the trainer model (I) compared with existing strategies (including none) (C) improve the ability to perpetuate resuscitation education (O)?"

In addition, we asked several secondary questions about the characteristics of successful TTT programs, including 1) What is the optimal length of instruction prior to allowing new trainers to teach? 2) How long are TTT programs expected to propagate? 3) What are the barriers/facilitators for new trainers that wish to continue the program by teaching their own courses? 4) What is the amount of knowledge degradation expected when the new trainers teach? What can be done to minimize this? 5) What alternative models have been compared to the TTT model? 6) Is TTT the fastest and most cost-effective way to disseminate information on the country level?

Definition of key terms

We defined key terms prior to the initiation of the search. (See Table 1) We used the World Bank classification for Low and Middle income Countries (LMICs) to define limited resource settings [11]. We used the term "generations" of program participants for ease of reporting the results of our review, i.e. the first generation is the first local group trained within the LMIC who will become the trainers, second generation is the group trained by the newly formed trainers, etc. Resuscitation training was defined as any medical training for any level of provider to improve their ability to act in a situation where the patient's life was in danger, including, but not limited to; neonatal resuscitation, basic life support, advanced cardiac life support, pediatric life support, trauma resuscitation, or first aid. Outcomes of interest were also prespecified and included the reach of the TTT programs (number of trained providers and length of continuous programming), the quality of training (knowledge and skills of trained providers) and the impact on patient outcomes.

Search strategy

PubMed, Cochrane Library, MEDLARS online (MEDLINE), and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases were searched for relevant articles. Using the key words "CPR", "Resuscitation", "Train the Trainer", "Low Resource Setting", "Developing Country", and "Education"; notably, during our initial searches, no filters were used to select out potential articles of interest. Using Endnote X7, selected articles were screened for duplicates and duplicates removed. Articles that were obviously irrelevant by title and abstract review were then excluded. This process identified the group of potentially relevant studies for which the full text was obtained for review.

Article appraisal

We used pre-established inclusion/exclusion criteria to assess article eligibility. Studies were eligible for inclusion if they 1) included a Train the Trainer model 2) occurred in a limited resource setting by World Bank LMIC criteria, 3) reported a measurable outcome related to the second generation or higher, 4) were available in English or Spanish, and 5) reported original research. All study types were included for potential selection (i.e., quasi-experimental, randomized controlled trials, and observation studies). (See Tables 1 and 2) A manuscript was excluded if the study type was a systematic review, if the article was not available in English or Spanish, if it described a program but reported no measured outcomes or reported outcomes only of the first generation. We felt this was particularly important because measuring outcomes of only the first generation amounts to measuring the impact of the training program and not the impact of the TTT model. Finally, manuscripts were excluded if they did not use the TTT model, or if they did not occur in an LMIC. If the authors disagreed on whether a study met inclusion criteria, a third reviewer was asked to review the paper to resolve the dispute. We also searched selected articles for additional relevant references. These full text manuscripts were then reviewed by both authors and the data extracted.

Post-hoc author communication

After manuscript review, because some key points were not addressed in any of the manuscripts, we decided to contact each of the corresponding authors to ask the following additional questions: 1) After the study, did you continue to collect data on how many total people your program trained? If yes, how many total people has your program trained? 2) Is your program still active now? 3) Prior to your study, how did you secure funding for this project? 4) If your program is still ongoing, where do you obtain funding to sustain your program? 5) When initiating your study, did you or your colleagues ever investigate the cost effectiveness of your program? If yes, please give us any details you feel comfortable sharing regarding the cost effectiveness.

Table 1
Definitions.

Criteria	Definition
World Bank Classification of Developing Country	As of 1 July 2015, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas Method of $1045 or less in 2014; middle-income economies are those with a GNI per capita of more than $1045 but less than $12,736; high-income economies are those with a GNI per capita of $12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of $4125. (GNI = gross national income)
Outcome measurement	Outcomes must have been measured and reported on the reach, quality, or impact of the trainings as defined by the eligible outcomes.
Number trained	Measurement of the number of trainees in the 2nd generation and beyond that were trained
Knowledge	Any measurement of the conceptual resuscitation knowledge gained by a program participant in the second generation
Skills	Measurement of hands-on skills acquired by second generation participants.
Patient Outcomes	Measurement of training effectiveness through the measurement of patient outcomes over a pre-determined period of time (i.e. decrease in number of cardiac arrest fatalities, decrease in neonatal mortality rates, etc.)