Clinical paper

Assessing self-efficacy of frontline providers to perform newborn resuscitation in a low-resource setting

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ABSTRACT

Objectives: Newborn deaths comprise an alarming proportion of under-five mortality globally. In this retrospective cohort study, we investigated the effectiveness of focused newborn resuscitation training and delivery of a positive-pressure device in a rural midwife population in a low-resource setting. The present research attempts to better understand the extent to which knowledge and self-efficacy contribute to resuscitation attempts by birth attendants in practice.

Methods: A one-year retrospective cohort analysis was undertaken in Aceh, Indonesia of two groups of community-based midwives, one having received formal training and a positive-pressure resuscitative device and the other receiving usual educational resources and management. A path analysis was undertaken to evaluate relative determinants of actual resuscitation attempts.

Results: 348 community-based midwives participated in the evaluation and had attended 3116 births during the preceding year. Path analysis indicated that formal training in resuscitation and delivery of a positive-pressure device were significantly related to both increased knowledge ($\beta = 0.55$, $p = 0.001$) and increased self-efficacy ($\beta = 0.52$, $p = 0.001$) in performing neonatal resuscitations with a positive-pressure device. However, training impacted actual resuscitation attempts only indirectly through a relationship with self-efficacy and with knowledge. Combined across groups, self-efficacy was significantly associated with positive pressure ventilation attempts ($\beta = 0.26$, $p < 0.01$) whereas knowledge was not ($\beta = -0.05$, $p = 0.39$).

Conclusion: Although, to date, evaluations of newborn resuscitation programs have primarily focused on training and has reported process indicators, these results indicate that in order to improve intrapartum-related hypoxic events ("birth asphyxia"), increased emphasis should be placed on participant self-efficacy and mastery of newborn resuscitation.

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1. Introduction

There has been significant progress in decreasing under-five mortality in accordance with Millennium Development Goal (MDG)

4, heralded by a decrease of 41% since 1990.[1] However, progress towards addressing newborn mortality has been much slower with 2.9 million newborns still dying annually and the contribution of newborn deaths as a proportion of under-five mortality increasing from 37% in 1990 to 44% in 2012 globally and reaching greater than 50% in many regions.[2] 1.2 million of the 2.6 million annual stillbirths also die during labor from largely the same causes.[3] Over 98% of these deaths occur in low- and middle-income countries (LMICs).[4] Without a reduction in these deaths, many countries will not be able to reach MDG 4 even beyond 2015.

Intrapartum-related hypoxic events ("birth asphyxia") comprise nearly one quarter of newborn deaths, and their prevention

requires immediate action within 1 min of birth. Given this and the expansion of community health providers in healthcare systems, there has been a greater emphasis on training these providers in newborn resuscitation with updated and clarified algorithms and materials such as with the Helping Babies Breathe® curriculum (HBB).[5] Introduction of simple devices developed for LMICs and on-site training has been shown to reduce neonatal mortality in the first 24 h by as much as 47%.[6]

Determining whether a simplified neonatal resuscitation program delivered by trained health workers can reduce neonatal death due to intrapartum-related hypoxia was recently deemed the number one research priority of the delivery domain in newborn care globally.[7] However, coverage of neonatal resuscitation has been woefully inadequate. In one evaluation, estimates of the percentage of all babies birthed by staff trained in neonatal resuscitation in six African nations ranged from 2 to 12%.[8]

Our previous research analyzed the effectiveness of a newborn resuscitation training program conducted in Indonesia beginning in 2005.[9] The training program occurred in a disrupted health system after the 2004 Asian tsunami and resolution of the civil conflict in the province of Aceh, Indonesia. The study assessed two groups of midwives. The Intervention Cohort was formally trained in newborn resuscitation as well as with the use and maintenance of a reusable positive-pressure ventilation (PPV) device. Provided in collaboration with the Ministry of Health in Aceh, our training program was a modified version of the American Academy of Pediatrics/American Heart Association's Neonatal Resuscitation Program™ (NRP). The modified training focused on assessment and therapeutic actions and consisted of steps up to and including positive pressure ventilation. Both a bag-valve-mask device and a tube-and-mask device were used in the instruction. Each birthing facility received bag-valve-mask devices and, in addition, each midwife received a tube-and-mask device upon successful completion of the training. This group was compared to a Control Cohort, which was not formally trained and received no device through this program. A similar number of midwives had attended at least one delivery in each cohort (63.6% versus 66.0%, $p = 0.67$) yet those in the Intervention Cohort provided PPV to a higher percentage of total births compared to the control cohort (5.21% versus 2.28% of newborns).[9] The Intervention Cohort rate corresponds to expected values that estimate 3–6% of newborns require basic resuscitation.[10] However, regardless of their cohort, midwives in both groups had similarly high resultant survival rates of newborns provided PPV. Hence, the willingness to perform newborn resuscitation at the time of critical need seems likely to be a key predictor for averting intrapartum-related deaths.

Provider self-efficacy (SE), or a person's *belief* that he or she is competent in a specific ability or behavior, has had limited attention in newborn resuscitation training literature as it pertains to actual practice.[11] A recent educational evaluation of HBB included an assessment of SE after training alone among 133 facilitators and learners.[12] In that study, similar to prior studies, discrepancies were noted between knowledge, skills, performance on manikins, and SE.[12,13] As training programs are scaled globally, specifically in LMICs, implementers will have to understand *how* providers will best learn, retain, and actually *use* this training in real-life situations.

SE is a widely researched concept consistently found to be a significant mediator and predictor of motivation and behavior change in new or challenging tasks.[14,15] Bandura's early research on SE found that a person's willingness to perform tasks was a stronger predictor of efforts to change and of behavioral outcomes than the type of training or learning model employed.[14] The American Psychological Association notes numerous health-related applications (e.g. pain management; exercise; management of high-risk behaviors related to smoking, substance abuse, eating, and human

immunodeficiency virus (HIV)).[16] In recent medical research, Turan et al.[17] found a significant relationship between SE and mastering the competencies of a medical education curriculum. SE has also been found to predict clinical performance in nursing students.[18] In the field of midwifery, Jordan and Farley[19] found that SE can be enhanced in recent midwife graduates by appropriate instruction. Nevertheless, because SE is domain-specific, any assessment should focus on the specific task being assessed. We believe that attention to SE has value in training in global health settings, particularly when local birth attendants are asked to learn new techniques and procedures in high-risk situations such as in neonatal resuscitation. Confidence in one's ability to intervene in such settings could significantly impact willingness to initiate resuscitation efforts.

In the current study, we hypothesized that formal training results in greater knowledge of the need for and practice of newborn resuscitation and in greater confidence (i.e., higher SE) in using a PPV device. Furthermore, we hypothesized that, regardless of training, those with greater levels of SE would be more likely to perform resuscitation and that SE would significantly contribute to resuscitation attempts with a positive-pressure device. These hypotheses are represented in the path model in Fig. 1.

2. Methods

As previously described, this study surveyed midwives in three districts in the province of Aceh, Indonesia, an area with a disrupted health system.[9] From October 16, 2008 to January 23, 2009, we conducted an evaluation of retrospective cohorts among community-based birth attendants in the districts of Aceh Barat and Nagan Raya (Intervention Cohort) and in Aceh Selatan (Control Cohort). The survey encompassed the preceding 12-month period from Ramadan to Ramadan in order to aid with recall.

Regions selected were similar in terms of demographics, geography, and impact of both the tsunami and the civil conflict. As above, the Intervention Cohort received training in the use of PPV devices, and each participant received a personal tube-and-mask device for use beginning in September 2005.

2.1. Training intervention

We reported the methods of the three-hour training intervention previously.[9]

The training program was implemented beginning in October 2005.

2.2. Training setting

The modified NRP training occurred on-site at midwives' places of work – often in a secondary clinic within the community.

2.3. Training content

The training curriculum included preparation for delivery, newborn drying, newborn assessment, stimulation and stabilization, and provision of ventilation (instruction was with both tube-and-mask and bag-valve-mask devices). This training was implemented before the release of the HBB curriculum in June 2010.

2.4. Training methods

First, an interactive lecture, predominantly of pictures and graphics, described the context and methods for neonatal resuscitation. After repeated modeling of resuscitation steps by peer-instructors to provide observational learning, hands-on practice with neonatal manikins and PPV was emphasized.