Neonatal Nursing and Helping Babies Breathe: An Effective Intervention to Decrease Global Neonatal Mortality

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Helping Babies Breathe (HBB) is an evidence-based medical educational curriculum designed to improve neonatal resuscitation and be taught in resource-limited circumstances. It has been field-tested for educational effectiveness and feasibility of wide implementation. We are committed to supporting the expansion of effective neonatal care, agree that HBB is highly suitable for that purpose, and promote the statement that "the time to act on behalf of every newborn infant is now" (Little G, Niermeyer S, Singhal N, Lawn J, Keenan W, Neonatal Resuscitation: A Global Challenge, Pediatrics, 2010;126(5):e1259-e1260). We also note that a program is only as effective as its systematic implementation and that neonatal nursing must serve an essential role in standard setting, education, and implementation of any bedside change in care of the newly born infant.

Keywords: Neonatal nursing; Helping Babies Breathe; Global neonatal mortality; Neonatal resuscitation

The neonate has only recently attained its rightful status as a full and equal partner in the spectrum of maternal, newborn and child health (MNCH) care, research, and policy initiatives. The United Nations Millennium Development Goals (MDGs) of the international development initiative for improving the social and economic conditions of the world's poor adopted 8 goals in 2000 that have a 2015 date for attainment. Significantly, 2 of the 8 goals are directed at MNCH: MDG 4 for child health including neonatal survival and MDG 5 for maternal health.1 Neonatal deaths (deaths in the first 28 days of life) are a major portion of child deaths, are often graphically depicted and monitored with under-5 mortality, and serve as a sentinel indicator of reproductive health. Most neonatal deaths occur within hours after birth.

The Global Neonatal Death Problem

There are about an equal number of neonatal deaths (3.6 million) and stillbirths (3.3 million) in the world each year with a remarkable 98% occurring in the less-resourced and developing world.2 Authorities agree that in most resource poor areas—those places with inadequate facilities, equipment, and trained providers—reliable data and information that distinguishes between stillbirth and neonatal death are not generally available and that clinical and research efforts should be directed at both.3,4 Although the stillbirth population in the resource-limited perinatal population is inadequately studied, it is apparent that a portion of stillbirths occur in late labor and delivery, are related to hypoxia, and may in fact not be stillbirths at all but babies who would respond to resuscitation efforts if recognized as such and survive if they received clinical intervention by providers skilled in resuscitation and subsequent care.5

Neonatal resuscitation is recognized as an intervention for which there is evidence of effectiveness.6-8 Of the many babies who die who would benefit from neonatal resuscitation, there are 2 large groupings: intrapartum-related deaths, often and previously described by the term birth asphyxia, are estimated to occur at an annual rate of approximately 814 000 globally. There is an obvious relationship between this group of babies and the late pregnancy stillbirths discussed in the previous paragraph. Complications of preterm birth are estimated to be associated with a million (1,033,000) deaths globally per year. In addition to resuscitation at birth, there are other interventions for which there is considered to be reasonable evidence of effectiveness in reducing risk of neonatal death of preterm infants, including thermal support such as skin-to-skin (kangaroo) care, early breastfeeding, and prevention/treatment of infection.9

Monitoring of MDG 4 progress has revealed that although both the under-5 mortality rate and the neonatal mortality rate are slowly decreasing, an increasing proportion of under-5 deaths occur in the neonatal period or the first 28 days after
Fig 1. Data from 2 sources. United Nations and the Institute for Health Metrics and Evaluation demonstrating that progress in reduction of the under-5 mortality rate slowed after rapid reduction between 1970 and 1990 and that the annual neonatal mortality rate has decreased more slowly with a resultant increased portion of neonatal deaths. Note the challenge remaining to reach the MDG 4 goal. Reprinted with permission.10

Helping Babies Breathe

*Helping Babies Breathe* (HBB) is a hands-on educational curriculum created specifically for birth attendants in resource-limited settings. The HBB’s heritage includes evidence derived from resuscitation research and previous resuscitation programs. The first page of the HBB Learner Workbook12 stresses 2 basic teachings:

- All infants need to be kept clean, warm, and encouraged to breastfeed;
- An infant who does not breathe needs extra help within the first minute after birth.

These basic HBB principles are applied within an internationally harmonized, evidence-based, and carefully constructed educational program that includes recommendations for teaching techniques and site arrangements. The curriculum is developed to be taught and applied in a wide range of environments ranging from established facilities to the most impoverished sites of health care systems. Educational and clinical equipment suitable for those environments has been developed and includes unique tools such as flip charts and low-cost manikins that serve as effective nonelectronic simulators. Field testing of the curriculum has taken place in several locations with reports appearing in the peer-reviewed literature.13 The following subsections elaborate and place into neonatal care context these and other details of the HBB curriculum and program.

**Historical Background**

HBB is a direct independent branch of the neonatal resuscitation tree of knowledge. It grows from appreciation of the unique physiology of the transition from fetal to neonatal existence and knowledge of the pathophysiology that can occur. The international recommendations that form the scientific basis of HBB originate from the International Liaison Committee on Resuscitation, an ongoing international effort for evidence review and derivation of recommendations for resuscitation at any age including neonatal.14 HBB focuses on resource-poor environments and interventions that are effective for most neonatal resuscitation challenges, whereas recognizing that situation-specific limitations may mean that some difficult and resource-demanding problems such as the needs of extremely low birth weight babies may not be possible to treat under the circumstances at the time. The principle that every infant deserves at least initial evaluation, effort, and judgment applies.

The Neonatal Resuscitation Program (NRP) of the American Academy of Pediatrics and the American Heart Association has been a prominent leader of neonatal resuscitation development and is now in its third decade. The NRP, along with other neonatal resuscitation programs, has been taught in more than 100 countries. Experience teaching and disseminating neonatal resuscitation around the world helped expand the growing understanding of the special needs of resource-poor environments.

**Educational Design**

Development of a standardized and flexible HBB education program was undertaken to facilitate use in widely varied environments. The *evaluation-decision-action* cycle repeats throughout and is presented in symbols and words. Adaptability to cultural and linguistic influences has always been a primary consideration.

The Action Plan seen in Fig 2 is a core integrative illustration within HBB and provides educational content and design information. Several specifics within HBB are worthy of note. Pictorial representation has been carefully developed to be universally recognizable. Color is seen in zones that signify the level of help needed: green, routine care; yellow, initial steps of help to breathe; and red, continued ventilation and possible need for advanced care. These colors, along with illustrations,
Fig 2. The HBB Action Plan.\textsuperscript{12} Note color zones guiding care paths, pictorial illustrations, and Golden Minute notation in the upper right corner indicating that bag/mask ventilation should be provided within a minute. Reprinted from the American Academy of Pediatrics. Helping Babies Breathe, Learner Workbook; 2010 with permission from the American Academy of Pediatrics.
Fig 3. Page 37 from HBB Learner’s Workbook. Note use of cases to further illustrate clinical pathways depicted in the Action Plan seen in Fig 2. Note coordinated colors and questions. Reprinted from the American Academy of Pediatrics. Helping Babies Breathe, Learner Workbook; 2010, p37 with permission from the American Academy of Pediatrics.

The Golden Minute adds the concept of time to the Action Plan and is a key part of the education curriculum content. The action plan design places this concept within the yellow color specific zone and in a specific dominant area to emphasize that the infant is the priority in the minute after birth. The core life-saving skill of HBB, bag-mask ventilation, is taught and illustrated to be applied by 1 minute after birth.

Table: Trace six cases

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry thoroughly</td>
<td>Dry thoroughly</td>
<td>Dry thoroughly</td>
<td>Dry thoroughly</td>
<td>Dry thoroughly</td>
<td>Dry thoroughly</td>
</tr>
<tr>
<td>Crying</td>
<td>Not crying</td>
<td>Not crying</td>
<td>Not crying</td>
<td>Not crying</td>
<td>Not crying</td>
</tr>
<tr>
<td>Keep warm</td>
<td>Keep warm</td>
<td>Keep warm</td>
<td>Keep warm</td>
<td>Keep warm</td>
<td>Keep warm</td>
</tr>
<tr>
<td>Check breathing</td>
<td>Position head</td>
<td>Position head</td>
<td>Position head</td>
<td>Position head</td>
<td>Position head</td>
</tr>
<tr>
<td>Clear airway</td>
<td>Clear airway</td>
<td>Clear airway</td>
<td>Clear airway</td>
<td>Clear airway</td>
<td>Clear airway</td>
</tr>
<tr>
<td>Stimulate breathing</td>
<td>Stimulate breathing</td>
<td>Stimulate breathing</td>
<td>Stimulate breathing</td>
<td>Stimulate breathing</td>
<td>Stimulate breathing</td>
</tr>
<tr>
<td>Breathing well</td>
<td>Not breathing</td>
<td>Not breathing</td>
<td>Not breathing</td>
<td>Not breathing</td>
<td>Not breathing</td>
</tr>
<tr>
<td>Cut cord</td>
<td>Cut cord</td>
<td>Cut cord</td>
<td>Cut cord</td>
<td>Cut cord</td>
<td>Cut cord</td>
</tr>
<tr>
<td>Routine care</td>
<td>Routine care</td>
<td>Routine care</td>
<td>Routine care</td>
<td>Routine care</td>
<td>Routine care</td>
</tr>
<tr>
<td>Breathing well</td>
<td>Monitor with mother</td>
<td>Monitor with mother</td>
<td>Monitor with mother</td>
<td>Monitor with mother</td>
<td>Monitor with mother</td>
</tr>
<tr>
<td>If meconium, clear airway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are 3 main questions in the Action Plan:
- Crying?
- Breathing?
- Heart rate?

The answers to these questions identify different pathways through the Action Plan and several different cases, as shown above. Trace each of the cases described above on the Action Plan (page 36). Remember, if meconium is present in the amniotic fluid, the airway is cleared before drying. The main key to success with Helping Babies Breathe® is practice. Practice during the course and as frequently as possible after the course.
Training

Train-the-trainer is the basic model used and advanced by HBB. The curriculum is designed for learners or trainees to participate in pairs or dyads with the 2 persons alternating as trainers (teachers) and trainee (learners), thereby changing roles during learning. Specific exercises are provided. Evaluation is integrated into the training experience with the learner expected to demonstrate knowledge, judgment, and skills such as bag-mask ventilation performance. Objective Structured Clinical Evaluations and multiple choice questions are used to complete the evaluation process.

Educational and Clinical Equipment

The HBB tools to facilitate training are available, and although not essential to the use of the curriculum, they have been developed in parallel and are available as a package (see helpingbabiesbreathe.org). In addition to the Learner Workbook, a flip chart for use by each learner pair is recommended. A low-cost neonatal manikin simulator is available that can be filled with air or water and is useful for scenarios. Clinical equipment in the form of a bag and mask and a newly designed suction device is available. Translation of educational material into multiple languages is encouraged and underway. We anticipate a dynamic inventive process. Development of other educational and teaching equipment as HBB is implemented is anticipated with appropriate field assessment reports in peer-reviewed informational exchange.

Field Testing

Before the June 2010 formal rollout of the HBB, field testing of the educational curriculum and program dissemination was undertaken. These efforts provided important data and information that was used before the rollout in modification of the curriculum and assessment. Ongoing field testing with publication of results is encouraged as future editions of HBB are anticipated.

Discussion

A “major gap” exists in the effort to decrease neonatal deaths by providing care to the infant intrapartum and early postnatally. Nurses and physicians with skills to care for children and, especially, neonates at birth are in very short supply in areas with high neonatal mortality. A recent publication points to a survey in sub-Saharan Africa that found that 15% of maternity hospitals had appropriate staff and equipment to perform neonatal resuscitation for a population where it is reasonable to expect that 30% of neonatal deaths can be averted. Attention is drawn to the need for new initiatives, with HBB mentioned specifically. 15

HBB is the product of rigorous effort to create a tested effective intervention to improve neonatal survival. The curriculum is designed to be part of a comprehensive neonatal care commitment such as Essential Newborn Care and the educational methodology was developed to be applied across systems and organizations of any size. The intent is to create educational and clinical excellence, and there are indications that HBB is in fact such a center or focus of excellence.

Dissemination and implementation of HBB is being guided and coordinated through a dynamic Global Development Alliance with multiple partners that include the American Academy of Pediatrics, the US Agency for International Development, Save the Children, the US National Institute of Child Health and Development, and Laerdal Medical. 16 The Global Development Alliance links with ministries of health, nongovernmental organizations, professional groups, and many others. The HBB programs have been initiated in a first tier of 26 countries with plans expanding nearly every day.

The potential of improving neonatal survival is building and near the tipping point. As mentioned in the introduction, new programs such as HBB integrated within Essential Newborn Care are only as successful as their systematic dissemination and implementation. Neonatal nursing plays an essential role in policy leadership, education, bedside decision making, and “hands on” practice. The discipline is facing an opportunity through HBB to be a change agent to significantly impact global neonatal mortality and morbidity.

Neonatal nursing is a key discipline within MNCH care and is undervalued and recognized as woefully understaffed in many places. The same descriptors can be applied to the medical profession members who are available to improve the care of the newly born. With increasing awareness of the needs of the neonate globally, the need for skilled pediatric personnel has assumed increasing prominence. This clearly apparent deficiency provides a strong rationale for concluding that nursing and medicine can and should deliberately collaborate to address professional growth and development and strengthen a child and infant focus.

Collaboration of nursing and medicine has been, and continues to be, dynamic and productive in the ongoing evolution of the NRP. The NRP is the established standard of resuscitation in the United States and is directly or indirectly reflected in the programs of many countries. A 5-year cycle for production of new NRP editions that now spread across 3 decades has involved collaborative multidisciplinary effort. Nursing, in addition to being very involved in the production of the NRP manual and teaching material, has always been a major leader and provider of NRP teaching and management at the regional and local level. This collaboration serves as a model for HBB as it explores implementation models and opportunities.

International nursing and medical organizations have an opportunity to draw closer together for reasons of their individual strength and their mutual ability and effectiveness to serve children. The International Pediatric Association 17 and the Council on International Neonatal Nurses 18 for example, should explore ways to cooperate and improve perinatal outcomes. Council on International Neonatal Nurses,
International Pediatric Association, and other organizations involved in MNCH should critically evaluate HBB and consider being actively involved in efforts that use HBB to decrease neonatal mortality and meet MDG 4 targets.

References