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DESCRIPTIVE MANUSCRIPTS

Basic Newborn Life Support (BNLS) for members of the public in natural disaster and conflict areas: A PHAID (PreHospital Aid) initiative

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ABSTRACT

Aim: The PHAID (PreHospital Aid) initiative aims to reduce morbidity and mortality in regions affected by natural disasters or conflict by providing basic equipment and preemptive training to members of the public. The newborn arm involved creating a basic newborn life support (BNLS) algorithm.

Size of Problem/Opportunity: Low- and middle-income countries (LMIC) are at greater risk of natural disasters and military conflict, which adversely impact already strained healthcare systems. Worldwide, ~60 million births occur outside healthcare facilities, mostly in LMIC. At birth, ~10% of babies do not breathe and require intervention, without which, hypoxic ischemic encephalopathy (brain injury due to starvation of blood and/or oxygen) and multiorgan damage can occur. Annually, there are >1 million cases of neonatal encephalopathy, of which 96% are in LMIC.

Results: We produced an expert-informed, simplified algorithm, feasible to be carried out by members of the public, focusing on drying and keeping warm, delayed cord clamping, recognizing which babies need help, and effectively delivering inflation breaths.

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Conclusion: In areas affected by conflict or natural disasters, newborn babies that do not breathe will die or suffer hypoxic ischemic brain injury. In that setting, there is benefit in providing members of the public with information and training to carry out a basic form of newborn life support. This is reflected in the PHAID newborn algorithm.

Keywords: neonatal resuscitation; newborn life support; low- and middle-income countries

خلاصة

الهدف: تهدف مبادرة المساعدة قبل المستشفى (PHAID) إلى تقليل معدلات الإصابة والوفيات في المناطق المتأثرة بالكوارث الطبيعية أو النزاعات من خلال توفير المعدات الأساسية والتدريب الوقائي لأفراد المجتمع. وتشمل المبادرة جانبًا خاصًا بالأطفال حديثي الولادة يتضمن إنشاء خوارزمية بسيطة لدعم الحياة الأساسية لحديثي الولادة (BNLS).

حجم المشكلة / الفرصة: تواجه البلدان منخفضة ومتوسطة الدخل (LMIC) مخاطر أكبر من الكوارث الطبيعية والصراعات العسكرية، مما يزيد من الضغط على الأنظمة الصحية التي تعاني بالفعل. على مستوى العالم، تحدث حوالي 60 مليون ولادة خارج المرافق الصحية، ومعظمها في البلدان منخفضة ومتوسطة الدخل. عند الولادة، لا يتنفس حوالي 10٪ من الأطفال ويحتاجون إلى تدخل، وفي حال غياب هذا التدخل، يمكن أن يتعرضوا للاعتلال الدماغي نتيجة نقص التروية ونقص الأكسجين. (إصابة الدماغ بسبب نقص الدم و/أو الأكسجين) وتلف متعدد في الأعضاء. سنويًا، هناك أكثر من مليون حالة إصابة باعتلال دماغي حديثي الولادة، ٦٩٪ منها تحدث في البلدان منخفضة ومتوسطة الدخل.

النتائج: قمنا بتطوير خوارزمية مبسطة قائمة على آراء الخبراء، يمكن تنفيذها من قبل أفراد المجتمع. تركز هذه الخوارزمية على تجفيف الرضيع والحفاظ على دفئه، و تأخير قطع الحبل السري، والتعرف على الأطفال الذين يحتاجون إلى مساعدة، وتقديم التنفس بشكل فعال.

الاستنتاج: في المناطق المتأثرة بالنزاعات أو الكوارث الطبيعية، فإن الأطفال حديثي الولادة الذين لا يتنفسون قد يموتون أو يعانون من اعتلال الدماغي نتيجة نقص التروية ونقص الأكسجين. في مثل هذه الظروف، يمكن أن يكون توفير معلومات وتدريب أفراد المجتمع حول دعم الحياة الأساسي لحديثي الولادة مفيدًا. وهذا ما تعكسه خوارزمية حديثي الولادة في مبادرة المساعدة قبل المستشفى.

الكلمات المفتاحية: الإنعاش لحديثي الولادة، دعم الحياة لحديثي الولادة، البلدان منخفضة ومتوسطة الدخل

ABSTRAITE

Objetivo: La iniciativa PHAID (*Ayuda Pre-Hospitalaria*) tiene como objetivo reducir la morbilidad y la mortalidad en regiones afectadas por desastres naturales o conflictos proporcionando equipamiento básico y formación preventiva a las personas no entrenadas. La rama dedicada a los recién nacidos consistió en la creación de un algoritmo básico de soporte vital neonatal (BNLA).

Dimensión del problema/oportunidad: Los países de ingresos bajos y medios (LMIC – *Low and middle-income countries*) tienen un mayor riesgo de sufrir desastres naturales y conflictos militares, lo que repercute negativamente en sistemas de salud ya de por sí sobrecargados. En el ámbito mundial, se producen aproximadamente 60 millones de partos fuera de centros sanitarios, la mayoría en LMIC. Al nacer, aproximadamente el 10% de los bebés no respiran y requieren intervención, sin la cual pueden producirse encefalopatía hipóxico-isquémica (lesión cerebral debida a la falta de riego sanguíneo y/u oxígeno) y daño multiorgánico. Anualmente, hay más de 1 millón de casos de encefalopatía neonatal, de los cuales el 96% se dan en LMIC.

Resultados: Basado en la opinión de expertos, elaboramos un algoritmo simplificado factible de ser aplicado por personas no entrenadas, que se centra en mantener a los bebés secos y calientes, el pinzamiento tardío del cordón umbilical, el reconocimiento de cuáles son los bebés que necesitan ayuda y la administración de ventilaciones eficaces.

Conclusión: En áreas afectadas por conflictos o desastres naturales, los recién nacidos que no respiran morirán o sufrirán una lesión cerebral hipóxico-isquémica. En este contexto, resulta beneficioso proporcionar información y formación para que cualquier persona pueda realizar una forma básica de soporte vital neonatal. Esto se refleja en el algoritmo de PHAID para recién nacidos.

Palabras clave: reanimación neonatal, soporte vital neonatal, países de ingresos bajos y medios.

People in regions affected by natural disasters or conflict have limited, if any access to healthcare. As members of the public, they have limited knowledge of how to treat resulting illnesses or injuries, even if willing and resourceful. PHAID (PreHospital Aid) aims to reduce preventable morbidity and mortality by providing preemptive medical training (https://www.phaid.org/).

One arm of PHAID is concerned with the newborn. In the UK, medical personnel assisting newborns requiring intervention at birth are trained in newborn life support (NLS). They follow an algorithm (Figure 1) based on recommendations from the International Liaison Committee on Resuscitation (ILCOR). Carrying out NLS requires access to expensive equipment and multiple, trained, personnel. Most low- and middle-income countries (LMIC) lack a standard system of newborn life support, compounded by a significant proportion of births taking place outside of healthcare facilities.

Therefore, PHAID Newborn aimed to produce a simplified algorithm for members of the public to provide basic aspects of newborn life support in regions where access to healthcare is limited.

THE SIZE OF THE PROBLEM/ OPPORTUNITY

Twenty-eight percent of births globally take place at home (95% CI: 0.24–0.33) (Hernandez-Vasquez et al., 2021). In twelve LMIC, this proportion reaches ~50–80%. Worldwide, an estimated 60 million births take place outside of healthcare facilities (Wall et al., 2009). Stratifying birth location by wealth quintile, in sub-Saharan Africa and South Asia, more than 70% of births in the lowest two quintiles occur at home (Montagu et al., 2011). In sub-Saharan Africa, even in the highest quintile, 40% of births were unattended.

At birth, ~10% of babies do not breathe (Kattwinkel, 2011). Of these, most only require stimulation, and if they do not respond to that, lung inflation and aeration. Only 0.1% (~1–2% of babies not breathing at birth) require chest compressions (cardiopulmonary resuscitation – CPR) (Lee et al., 2011). Lack of appropriate intervention results in death or significant neurological damage. Annually, over 1 million babies are affected by neonatal encephalopathy, 96% of which are born in LMIC, where the incidence is 1.5–20.3 per 1000 live births (compared to 0.5–3 in high income countries) (Kukka et al., 2022; Lee et al., 2013; McIntyre et al., 2021).

Lee et al. (2011) used a Delphi process to estimate the potential reduction in intrapartum related neonatal deaths in community-born term-babies in the presence of a midwife or trained birth assistant (TBA). If every baby requiring resuscitation received drying and stimulation, they estimated a reduction of 10% (IQR 5–15%). Provision of 'basic resuscitation' (airway clearing, head positioning, and positive pressure ventilation via bag and mask) was estimated to reduce mortality by a further 20% (IQR 15–25%).

SIMPLIFIED ALGORITHMS FOR LMIC

In response, the World Health Organization (WHO), American Academy of Pediatrics (AAP), and Save the Children, have produced simplified NLS algorithms and training packages more appropriate for LMIC, balancing strength of evidence and numbers needed to treat, with feasibility regarding cost and availability of equipment, and possibility of training and retaining proficiency (AAP, 2016; Newton & English, 2006; Wall et al., 2009; WHO, 2012).

For example, differences between the AAP 'Helping Babies Breathe' (HBB) algorithm (Figure 2) and the Resuscitation Council UK (RCUK) NLS algorithm

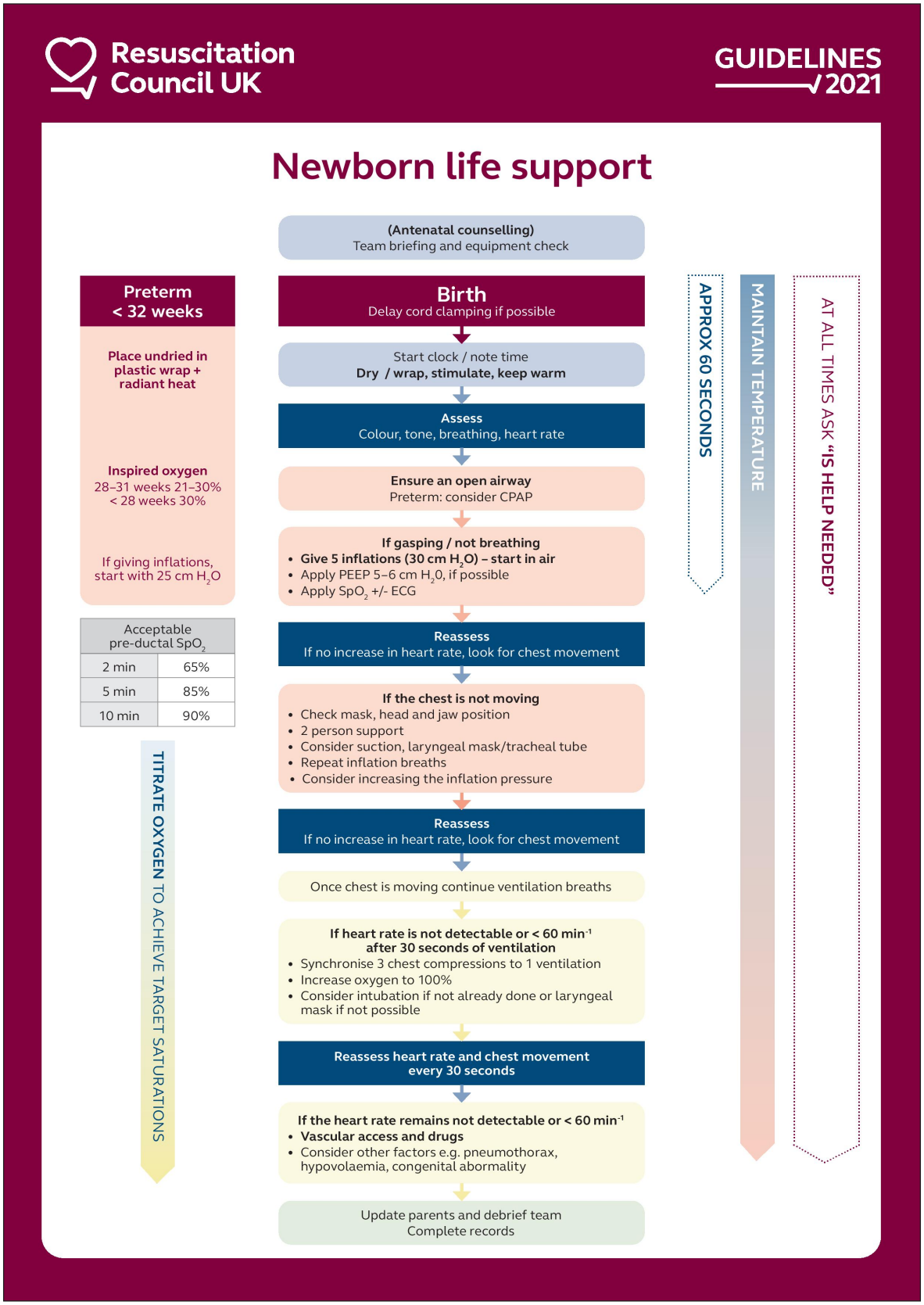

Figure 1: 2021 Resuscitation Council UK NLS (newborn life support) algorithm (reproduced with permission) (Resuscitation Council (UK), 2021).

(Figure 1) include lack of heart rate assessment in the initial stages, pulse oximetry, airway adjuncts, chest compressions and drugs. However, drying and stimulating, keeping baby warm, delayed cord clamping and inflating baby's lungs are retained. Since the inception of HBB, more than 850,000 birth attendants in 80 countries have been trained, with positive feedback (Singhal et al., 2020). A systematic review of studies comparing pre- and post-implementation 1-day neonatal mortality rate found a significant reduction (Versantvoort et al., 2020). A similar reduction in seven-day neonatal mortality was found post-training of Zambian midwives using the WHO Essential Newborn Care (ENC) course (Chomba et al., 2008).

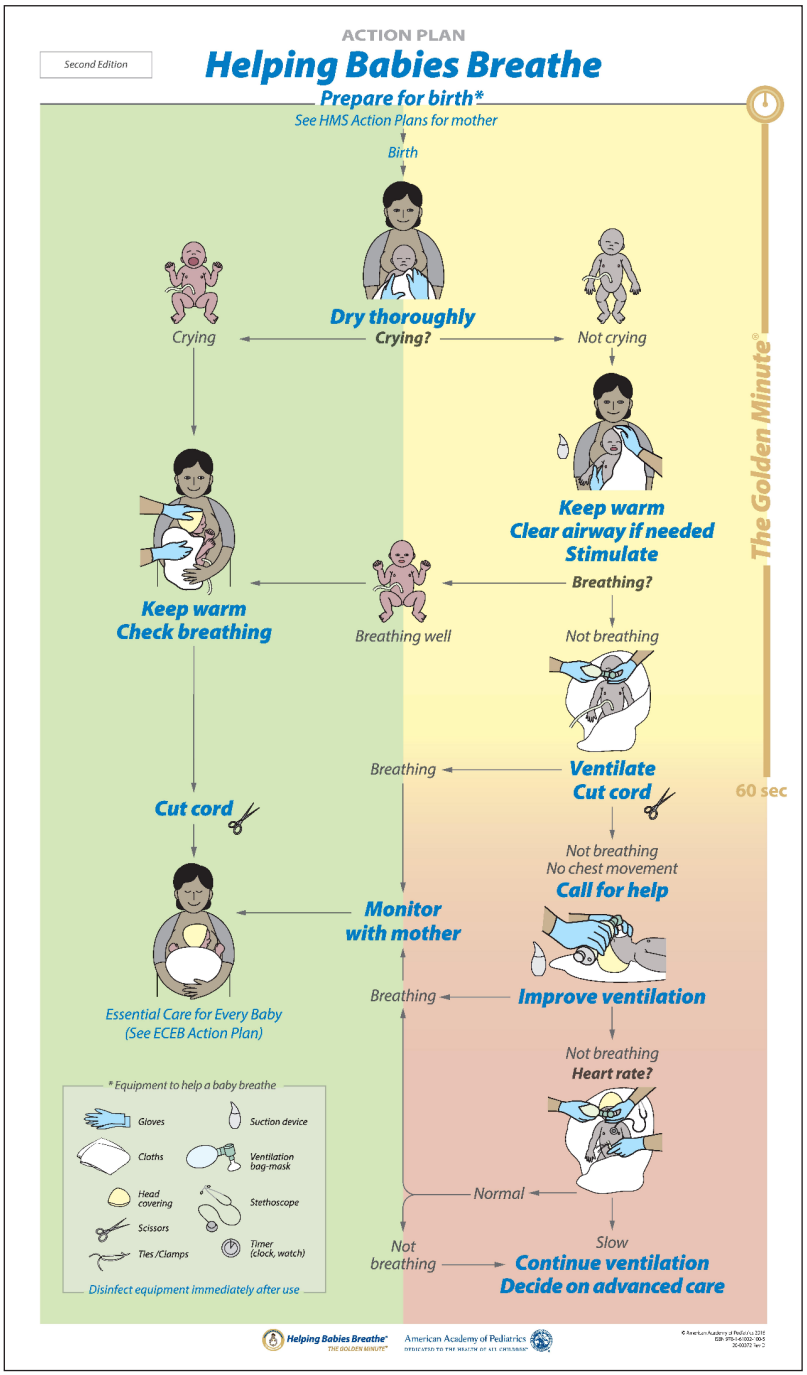

Figure 2: Helping Babies Breathe (HBB) action plan (second edition) (reproduced with permission) (AAP, 2016; Niermeyer et al., 2016).

THE NEED TO GO FURTHER

These algorithms are still aimed at medical or 'experienced' personnel and require equipment such as a suction device and bag-mask. These are not always available in community settings, especially in areas affected by conflict or natural disasters. In 2015 one baby was born roughly every two seconds in a conflict zone (UN, 2015). In 2018, this totaled ~29 million newborns (UNICEF, 2019). This led to the question; can a simplified version of newborn resuscitation be taught to members of the public?

This is already the case for basic adult and pediatric life support, exemplified by the European Resuscitation Council (ERC), ILCOR, and WHO backed 'Kids Save Lives' initiative. The UK secondary school curriculum now includes CPR and use of an automated external defibrillator (AED). The reasoning behind this is that post cardiac arrest, the brain can only survive for 3–5 minutes while starved of oxygen, which is less time than it takes emergency medical services to arrive. This has led to a less than 1-in-10 survival rate. In cases where members of the public initiate immediate basic life support, survival improves by a factor of 2–4 (Kids Save Lives, 2015). The same principles also apply to newborn resuscitation.

BALANCING RISKS WITH BENEFIT

Providing simplified NLS training to members of the public might provide a false sense of reassurance regarding the safety of childbirth outside medical facilities and in the absence of trained personnel (Lee et al., 2011; Wall et al., 2009). It might cause delays in seeking medical help. However, in areas affected by conflict or natural disaster, access to healthcare facilities or medical personnel is often not possible and so death or severe neurological damage is the inevitable outcome when a baby does not breathe at birth.

The newborn brain and heart are relatively resistant to hypoxia. It is estimated from onset of insult to death takes ~20 minutes (Figure 3) (Hey & Kelly, 1968). However, labor is of variable duration and hypoxic ischemic insults have often started in-utero. Babies born in terminal apnea or primary apnea but unable to aerate their lungs while gasping quickly suffer hypoxic ischemic damage. Even if subsequently resuscitated, a significant proportion will later die or develop significant neurodevelopmental sequelae, even in healthcare systems that can offer neonatal intensive care including therapeutic hypothermia.

A systematic review of prehospital emergency care in LMIC found *'insufficient multidisciplinary teams and poor infrastructure, including road access, lack of basic materials, and uncoordinated and fragmented system(s)'* which meant patients were often attended by members of the public as first responders and transported to healthcare facilities by family members rather than ambulances, with difficult terrain causing delays (Bhattarai et al., 2023). Only a minority of ambulances across LMIC were staffed by basic life support (BLS) trained personnel. In the studies that assessed prehospital time intervals, activation time (0.4–4.5 minutes), response time (6.6–24.2 minutes),

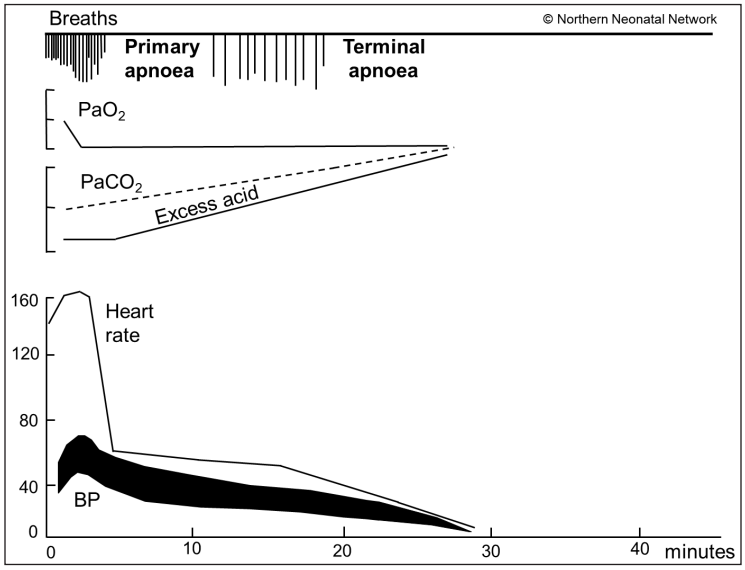

Figure 3: Response of a mammalian fetus to total, sustained asphyxia (reproduced with permission from Resuscitation Council UK).

scene time (10.3–18.0 minutes), and transport time (7.2–83.5 minutes), varied significantly.

Therefore, in many LMIC settings when a baby is born in the community and does not breathe, by the time medical personnel would reach it (or vice versa), death or significant neurological damage would have occurred. In these situations, there is hypothetical benefit for members of the public to be trained in a basic form of neonatal resuscitation.

METHODS

Utilizing our combined expertise in neonatal medicine, newborn resuscitation, and healthcare provision in areas affected by conflict and natural disasters, we studied the differences between, and modified further newborn life support algorithms designed for developed healthcare systems (i.e. RCUK NLS) and LMIC (e.g. AAP HBB), applying the context of members of the public carrying out basic newborn life support in areas affected by conflict or natural disaster with lack of access to healthcare services or personnel. Our rationale and evidence base for the changes we made are set out below. We invited neonatologists who have worked in LMIC and/or have expertise in the field of resuscitation to review our algorithm. This included two iterative rounds of discussion with the RCUK Newborn Committee, attended by 25 members with medical, nursing, midwifery and paramedic expertise. Based on feedback obtained further changes, if deemed appropriate, were made to best describe a first aid approach to Basic NLS.

RESULTS

PreHospital aid (PHAID) Basic Newborn Life Support (BNLS)

The basic newborn life support algorithm included in the PHAID Childbirth and Newborn pack is shown in Figure 4. In devising this, we considered the following.

Drying and keeping warm

Recommendation: Immediate skin-to-skin with mother after birth, drying and stimulating baby on mother.

Rationale: At birth, babies transition from a warm wet environment to a cold dry one. They lose heat most precipitously via evaporation of residual amniotic fluid, but also conduction if placed on a cold surface. Core temperature can drop 2–3°C within 30 minutes (Dahm & James, 1972). In response to this, non-shivering thermogenesis takes place (a metabolic process that produces heat without muscle activity). When prolonged and/or in babies with respiratory insufficiency, this leads to acidemia and hypoglycemia. Hypothermia induced pulmonary vasoconstriction can lead to persistent pulmonary hypertension of the newborn (PPHN). A study of over 23,000 newborns born in southern Nepal found that for every degree decrease in first observed axillary temperature, mortality increased ~80% (Mullany et al., 2010).

The process of drying provides tactile stimulation, which results in the baby grimacing, moving, crying, and can improve oxygenation (especially with repetitive stimulation) (Kaufmann et al., 2022). Once dried, maintaining normothermia is difficult, even in developed countries (Chitty & Wyllie, 2013). The importance of skin-to-skin (also called kangaroo mother care) is well established for preterm babies, especially in LMIC, in reducing hypothermia, mortality and risk of infection (Sivanandan & Sankar, 2023). In term newborns, skin-to-skin is effective in maintaining normothermia, increasing cardiovascular stability and blood glucose levels (Moore et al., 2016).

Delayed cord clamping

Recommendation: Assessment of baby made while skin-to-skin with mother and umbilical cord intact.

Rationale: Delayed cord clamping (DCC) for 1–2 minutes provides the baby with a placental blood transfusion due to uterine contractions and negative intrathoracic pressure as it takes its first breaths. Volumes of 100ml or an additional 30% blood volume have been quoted, resulting in increased hemodynamic stability in the immediate postnatal period, and reduced risk of anemia at 2–3 months of age (Hutton & Hassan, 2007; Katheria et al., 2017; McDonald et al., 2013; Sommers et al., 2012). There is some evidence that this is associated with increased myelination at 4 months and better neurodevelopment at 12 months (Mercer et al., 2018; Rana et al., 2019).

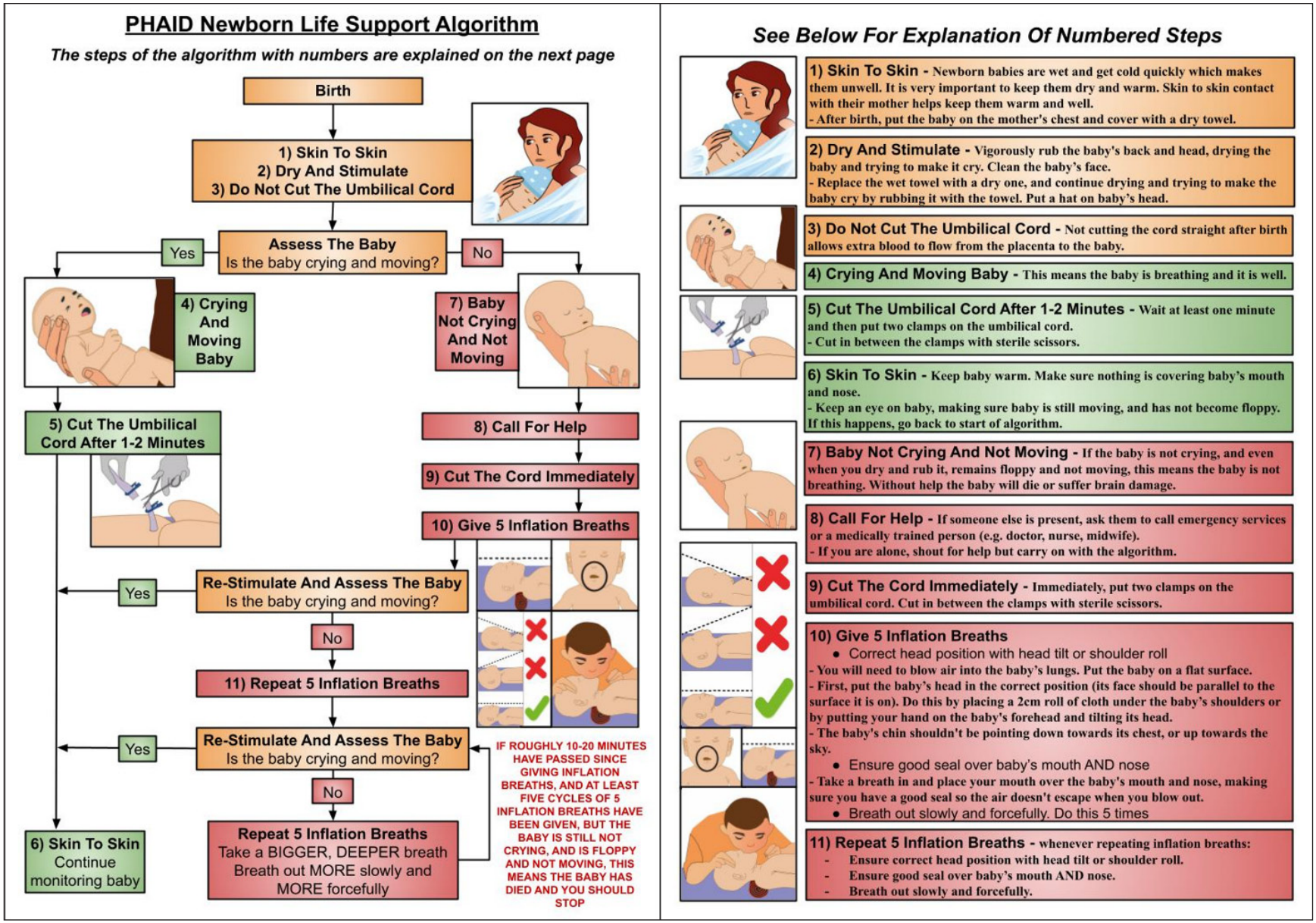

Figure 4: PreHospital aid (PHAID) Basic Newborn Life Support (BNLS) algorithm.

Recognizing which babies need help

Recommendation: Using presence or absence of crying and/or movement to assess whether baby is well or requires help (no auscultation or palpation of heart rate).
Rationale: The RCUK NLS course assesses babies' color, tone, heart rate, breathing adequacy, and blood oxygen levels using visual inspection, auscultation, and pulse oximetry. In community settings in LMIC, such an assessment is rarely feasible. A survey of 173 policymakers, program implementers and researchers from 32 countries scored 'not crying' and 'not breathing' most highly for identifying asphyxiated babies, which are the parameters used by HBB (Figure 2) (AAP, 2016; Lawn et al., 2007). The WHO recommends resuscitating babies that do not cry, breath, or are gasping 30 seconds after birth (WHO, 2012). A study by Ghosh et al. (1997) found the combination of cry, color and activity most closely correlated with cord blood pH. They replaced "tone" with "activity" since it would be easier for nonmedical personnel to assess.

We chose a combination of cry and activity. These do not require medical training or experience to identify. If a baby is crying and moving (responding to stimulation with grimacing and limb movement, spontaneously opening their eyes, and holding themselves in a flexed position), they are aerating their lungs, breathing adequately, and will have a good heart rate. We did not use breathing because it is difficult to know what is normal (versus irregular or shallow breaths, or gasping) for members of the public. We did not use color because non-white babies are not pink, well newborn babies are initially cyanotic, the appearance altered by ethnicity, and 'pale' is a subjective term.

Heart rate was also not used. Feeling umbilical cord pulsation or palpating the brachial or femoral pulse is not easy or reliable and would waste valuable time in a baby requiring resuscitation (Whitelaw & Goldsmith, 1997). Even if a stethoscope was available, auscultating the heartbeat and judging whether it is 'fast' enough not to warrant intervention, or 'slow' is not an assessment members of the public can be expected to make.

Aerating the lungs

Recommendation: Achieving correct head position using head tilt and/or shoulder roll (no use of jaw thrust). Repeated cycles of inflation breaths via mouth-to-mouth (and nose), followed by stimulation and assessing response by looking for presence of crying and/or movement (no assessment of heart rate).
Rationale: Fetal lungs are collapsed and fluid filled. With its first breath, the newborn baby generates negative pressure of ~20cm water (Milner & Sauders, 1977). This inflates and aerates its lungs, forcing fluid into pulmonary interstitial tissue. Once crying, intrathoracic pressure can increase to 90cm water, further aiding fluid clearance.

If the baby fails to breathe at birth, its lungs need to be inflated and aerated. In most babies born at term, delivering five 2–3 second breaths at a pressure of 30cm water is effective. Higher pressure delivered for less time also works (e.g. 40cm water for 0.5–1 second) (Upton & Milner, 1991). Even with a bag-valve-mask device, pressure cannot be accurately controlled, let alone mouth-to-mouth. Therefore, we did not specify pressure or duration, instead instructing first aiders to take a deep breath, form a good seal around the baby's nose and mouth, and breath out slowly and forcefully. Because most babies that are not breathing and do not respond to stimulation will respond to lung aeration, and the difficulty for members of the public to deliver adequate inflation breaths, this step is repeated several times in the algorithm. On the third attempt, we instruct taking a bigger, deeper breath and to breathe out more forcefully and more slowly, to increase both the pressure and duration of the inflation breaths. After each intervention, the baby is restimulated by being rubbed with the cloth it is wrapped in. If the inflation breaths have been adequately delivered, further stimulation should elicit a response of crying and movement in most babies.

In the RCUK NLS course, adequateness of inflation breaths is judged by chest movement or increase in heart rate. Even for medical personnel, chest movement in the newborn baby can be difficult to judge. The reason for giving five inflation breaths is that the first few might not cause lung aeration and chest movement, even if correctly delivered. Where there is ambiguity, inflation breaths should be repeated. Furthermore, providing inflation breaths via mouth-to-mouth would make it difficult to see chest movement, and we have already discussed why we would not use heart rate assessment. Therefore, our

algorithm relies on the baby beginning to cry and move as an indicator of inflation breath adequacy.

To aerate the lungs, opening the airway is the first step. In an unconscious, hypotonic baby, the neck will flex due to the large occiput (the back of the head), the pharynx can collapse, and the tongue can fall back, all of which can obstruct the airway. To ensure an open airway, the head can be tilted back until the face is in a neutral position, also achieved with a small shoulder roll. In the RCUK NLS course, a one- and two-handed jaw thrust is taught. However, even medically trained candidates require practice on manikins with movable jaws to be able to perform this competently. Furthermore, applying pressure to the soft tissue beneath the chin can push the tongue base backwards, worsening airway obstruction. Therefore, we do not expect members of the public to do this. Instead, each time inflation breaths are repeated, we stress the need to ensure correct head position via head tilt or shoulder roll.

Chest compressions

Recommendation: No progression to chest compressions, even if no response to inflation breaths.

Rationale: We have not included chest compressions in our algorithm. Only a fraction of babies require resuscitation beyond stimulation and inflation breaths. In one study, over a two-year period only 39 of 30,839 babies (0.12%) required chest compressions and/or adrenaline (Perlman & Risser, 1995). If a baby does not respond to lung inflation, the most likely reason is the lungs have not been successfully aerated and moving onto chest compressions has no benefit. Furthermore, it diverts attention from establishing and maintaining the airway and delivering effective inflation breaths. In the study, 31 of the 39 babies who received chest compressions were inadequately ventilated. If, even in a healthcare setting with trained medical personnel, the most likely reason for failure to respond to inflation breaths is that the lungs have not been successfully aerated, this is even more likely for members of the public in the out-of-hospital setting. Therefore, the priority must be on successfully delivering inflation breaths rather than moving onto chest compressions. This is leaving aside the issues of requiring a second person, the feasibility of delivering effective chest compressions, and the impact this would have on maintaining adequate ventilation.

Furthermore, of the very small number of babies that do require chest compressions, a significant proportion will subsequently require mechanical ventilation. Some will suffer from hypoxic ischemic encephalopathy and multi-organ damage. In regions where it is not possible to deliver this level of care, it is not appropriate to advise members of the public to provide extensive newborn resuscitation.

Suctioning

Recommendation: No advice to suction the baby's airway, even if no response to inflation breaths.

Rationale: There is no evidence for the benefit of suctioning amniotic fluid, vernix, meconium, mucus, or blood from the oropharynx, even if a suction device is available. Suction must always be under direct vision, otherwise there is risk of damage to mucosal tissues, which can cause bleeding and worsening of the situation. Any obstruction would be at the laryngeal level. To visualize and remove it would require a laryngoscope, wide bore catheter, and suction device. This is not feasible given our target population.

Stopping resuscitation

Recommendation: If roughly 10–20 minutes have passed since giving inflation breaths, and at least five cycles of 5 inflation breaths have been given, but the baby is still not crying, and is floppy and not moving, this means the baby has died and resuscitative efforts should stop.

Rationale: HBB advises that *"if advanced care or suitable transport is not available, discuss with parents and consider stopping ventilation after 20 minutes if heart rate is slow or the baby does not breathe"* (AAP, 2016, p. 41). Wall et al. note that *"if the baby is still not breathing after 10 minutes, even if there may be a heart rate…some experts advocate that if there are no facilities for intubation and ventilation then resuscitation should be stopped…"* (Wall et al., 2009, p. 8). In our algorithm, we advise to stop if roughly 10–20 minutes have passed and at least five cycles of 5 inflation breaths have been delivered, but the baby is still not crying and moving. We did not only

use a number of cycles of inflation breaths as these may be delivered quickly and ineffectively. We did not only use a time duration because only one or two cycles may be delivered in that time. Therefore, we included both parameters. We included a time range because given our target environment and audience, it is unlikely the time of birth is noted, and we wanted first aiders to focus on correctly performing the steps of the algorithm versus specific times.

LIMITATIONS/NEXT STEPS

Basic newborn life support has not previously been taught to members of the public, and so while the concept is proven (i.e. teaching of BLS to members of the public for use on children and adults), our work is novel. The process of implementation is currently underway with international partners in the charity sector who have experience providing humanitarian aid in regions affected by conflict/natural disaster. This will form part of the validation process through feedback on ease of use and effectiveness. PHAID educational materials on treatment of bleeding wounds, childbirth, and newborn life support, have been shown to medical personnel via informal focus groups in Pakistan, Turkey, Bangladesh, and Uganda. They have appreciated the gap in healthcare this work addresses and therefore its urgent need and expressed interest in obtaining the material for local use. We are also creating videos that provide access to the educational materials in a visual and auditory format and producing translations of all materials in local languages.

CONCLUSION

In areas affected by conflict or natural disaster, there is limited access to healthcare facilities or medical personnel. Newborn babies that do not breathe will die or suffer hypoxic ischemic brain injury. In that setting, there is benefit in providing members of the public with information and training in how to carry out a basic form of newborn life support. This should focus on drying, stimulating, keeping the baby warm, delayed cord clamping, and for those that require it, inflation breaths using mouth-to-mouth. This is reflected in the PHAID BNLS algorithm we have designed. If this proves to be effective, there may be benefit in expanding this to other regions where a significant number of community births take place.

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- **Dr Babu Kumararatne** – consultant neonatologist (UK), clinical lead for the West Midlands Neonatal Operational Delivery Network.
- **Dr Joe Fawke** – consultant neonatologist (UK), chair of the Resuscitation Council (UK) NLS (Newborn Life Support) & ARNI (Advanced Resuscitation of the Newborn Infant) subcommittees, ILCOR (International Liaison Committee on Resuscitation) NLS task force member.
- Members of the RCUK NLS and out-of-hospital NLS subcommittees.

Abstract Translations provided by Bassinte Ossama (Arabic) & Luis Miguel Pascual Gomez (Spanish).

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions to the following:

1. Drafting the article or revising it critically for important intellectual content,
2. Final approval of the version to be submitted and
3. Agreement to be accountable for all aspects of the work.

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