

IMPLEMENTATION ISSUES AND LESSONS LEARNED FROM A PILOT PROJECT ON BASIC NEONATAL RESUSCITATION IN BURKINA FASO.

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SUMMARY

Birth asphyxia, a leading cause of neonatal deaths in sub-Saharan Africa could be addressed by the training of front-line birth attendants in basic neonatal resuscitation (BNR) based on the Helping Babies Breathe (HBB) curriculum. This study aimed at assessing the implementation process of a pilot basic neonatal resuscitation study conducted in the Cascades region, Burkina Faso. The intervention started in 2014 and involved 8 health centres from different levels throughout the regional health system. A total of 19 front-line birth attendants were trained on BNR. The mean score of knowledge on BNR moved from 13 to 15, $p < .05$. A year after the initial HBB training-workshop, 32% of the trained staff moved out from their original sites. Almost all of the sites had at least one non-functioning BNR item, and a refresher training was only conducted in 2 sites. The study forms were not regularly filled out. BNR-training as per the HBB curriculum for frontline staff was feasible and accepted by birth attendants in Burkina Faso. The sustainability of the intervention was threatened by regular moves from the staff within and outside the study area, low refresher trainings for peers and poor maintenance of the BNR items.

Keywords: Neonatal resuscitation-Helping Babies Breathe-Burkina Faso

Questions de mise en œuvre et enseignements tirés d'un projet pilote sur la réanimation néonatale de base au Burkina Faso.

RÉSUMÉ

L'asphyxie à la naissance, une des principales causes de décès néonataux en Afrique subsaharienne pourrait être remédiée par la formation des agents accoucheurs de première ligne en réanimation néonatale de base (RNB) sur la base du curriculum Helping Babies Breathe (HBB). Cette étude visait à évaluer le processus de mise en œuvre d'une étude pilote de réanimation néonatale de base menée dans la région des Cascades, au Burkina Faso. L'intervention a commencé en 2014 et a impliqué 8 centres de santé de différents niveaux du système de santé

régional. Au total, 19 agents accoucheurs de première ligne ont été formés à la RNB. Le score moyen de connaissances sur le RNB est passé de 13 à 15, $p < 0,05$. Un an après la formation HBB, 32% du personnel formé a quitté son site d'origine. Presque tous les sites avaient au moins un matériel de RNB non fonctionnel, et une formation de recyclage n'a été dispensée que dans 2 sites. Les formulaires d'étude n'étaient pas régulièrement remplis. La formation à la RNB selon le programme HBB était faisable et acceptée par les agents accoucheurs de première ligne au Burkina Faso. La pérennité de l'intervention a été menacée par des déménagements du personnel à l'intérieur et à l'extérieur de la zone d'étude, le faible taux de réalisation des formations de recyclage pour les pairs et un mauvais entretien du matériel de RNB.

Mots-clés: *Réanimation néonatale- Aider les bébés à respirer-Burkina Faso*

BACKGROUND

Under-five mortality is still a major public health concern in sub-Saharan Africa with western and central Africa paying the highest toll with an under-five mortality rate (U5MR) of 79 per 1000 live births in 2017 [WHO, 2018]. Neonatal deaths account for approximately half of the infant deaths in this part of the world [Costello and White, 2001].

Birth asphyxia is a major cause of neonatal deaths and could represent up to 20% of these deaths [Black et al., 2003]. Basic neonatal resuscitation (BNR) alone has the potential to save the lives of millions of children [Wall et al., 2010] and studies have demonstrated the positive impact of BNR in saving lives of neonates suffering from birth asphyxia [Wall et al., 2009]. In Africa the lack of neonatal resuscitation equipment is a severe bottleneck [Enweronu-Laryea et al., 2015]. Indeed, the lack of trained workforce for neonatal resuscitation is a recurrent concern for health systems in low and middle-income countries [Enweronu-Laryea et al., 2015] with only 2-12% of babies born in facilities where staffs are trained in neonatal resuscitation, and only 8-22% born in facilities with equipment for newborn respiratory support [Wall et al., 2009].

[Wall et al., 2010] 814,000 neonatal deaths and studies have demonstrated the positive impact of BNR in saving lives of neonates suffering from birth asphyxia [Wall et al., 2009]. In Africa the lack of neonatal resuscitation equipment is a severe bottleneck [Enweronu-Laryea et al., 2015]. A tool was applied by 12 countries in Africa and Asia as part of the Every Newborn Action Plan process. Country workshops engaged technical experts to complete the survey tool, which is designed to synthesise and grade health system "bottlenecks" that hinder the scale up of maternal-newborn intervention packages. We used quantitative and qualitative methods to analyse the bottleneck data, combined with literature review, to present priority bottlenecks and actions relevant to different health system building blocks for BNC and neonatal resuscitation. RESULTS: Eleven of the 12 countries provided grading data. Overall, bottlenecks were graded more severely for resuscitation. The most severely graded bottlenecks for BNC were health workforce (8 of 11 countries). Indeed, the lack of trained workforce for neonatal resuscitation is a recurrent concern for health systems in low and middle-income countries [Enweronu-Laryea et al., 2015] with only 2-12% of babies born in facilities where staffs are trained in neonatal resuscitation, and only 8-22% born in facilities with equipment for newborn respiratory support [Wall et al., 2009].

Strengthening health facilities, especially delivery wards capacity in BNR is crucial. This capacity building requires having at least first-line birth attendants well trained and maintaining BNR skills and facilities equipped with supplies for BNR. Indeed, the presence of a skilled birth attendants and provision of basic emergency obstetric care can reduce intrapartum birth asphyxia by 40% [Ariff et al., 2016].

Burkina Faso is one of the countries with the highest U5MR of 81 deaths per 1000 live births and a neonatal mortality rate of 25 per 1000 live births in 2017 [WHO, 2018]. There is no data on birth asphyxia-related neonatal deaths in Burkina Faso, where 83.6% of births are attended by a skilled birth attendant [Direction générale des études et des statistiques sectorielles, 2018].

In Burkina Faso, BNR is taught more theoretically during the initial training at medical or nursing schools. There is no continuing training scheduled for those who received this training. Moreover, mainly maternity and neonatal wards of the big hospitals have the required equipment for resuscitation.

Babies suffering from birth asphyxia are prone to deaths above all in rural areas and birth attendants usually rely on improvised tools or techniques to assure the resuscitation of babies. To address this gap, the Helping Babies Breathe (HBB)/Laerdal pilot project has been implemented in the Cascades region, one of the regions worst stuck by neonatal deaths in the country with a neonatal mortality rate (NMR) of 46.3 per 1000 live births [Diallo et al., 2011].

This project trained first-line birth attendants in BNR and equipped health facilities with BNR tools to curbe the neonatal death related to birth asphyxia. Continuous on-site training and correct maintenance of the dedicated equipment are crucial to achieving the end point of saving lives of neonates suffering from birth asphyxia. We aimed at assessing the implementation process of a BNR pilot project in rural Burkina Faso.

METHODS

Setting

The study took place in the Cascades region. Located in the Southern-Western Burkina Faso, this region is one of the most burdened by neonatal deaths in the country with a neonatal mortality rate estimated to be 46.3 per 1000 live births (95% CI: 22 to 70) [Diallo et al., 2011]. A total of 8 health facilities (sites) at different levels of the health care pyramid were involved. At the bottom level (CSPS du secteur 8, CSPS de Flantama, CSPS de Kouèrè, CSPS de Sidéradougou and CSPS de Soubakaniédougou), at the intermediate level (CM de Niangoloko) and at the top level (the maternity and the pediatric wards of the regional referral hospital) were involved in this project.

Study design and population

This was a before/after interventional study started in December 2014. The intervention consisted of mainly two components: training front-line birth attendants on BNR and equipment of the health facilities with BNR tools and an on-site continuous monitoring and refresher training.

Initial training of the front-line birth attendants on BNR and equipment of the health facilities with BNR tools

Front line births attendants from 8 health facilities of the Cascades region have been trained to BNR according to the HBB curriculum named “Aider les bébés à respirer”, the French translation used in this study. “Aider les bébés à respirer” curriculum modules encompass thermoregulation, stimulation to breathe, and basic assisted ventilation when needed. This curriculum emphasizes the use of these techniques in “The Golden Minute,” which is the first minute following birth [American Academy of Pediatrics, 2017].

The train-the-trainer strategy was used. This involved a certified neonatal resuscitation instructor training master trainers first and then supporting master trainers while they trained remaining participants. Techniques used for training included hands-on demonstration, simulations using the NeoNatalie, overview of the HBB Action Plan, small group collaboration, as well as modelling proper assembling, disassembling, and cleaning of resuscitation equipment.

Once trained, certified birth attendants should conduct on-site peer-training and simulations. An initial assessment of the knowledge of the birth attendants were conducted before and after the training session.

The health facilities were subsequently equipped with BNR tools (one Neonatalie[®] simulator, one suction device, and one bag and mask). They received instructions to assure routine maintenance of the tools and to perform data collection through a questionnaire designed to allow evaluation of the intervention impact.

On site monitoring visits and training

On-site monitoring visits have been scheduled and conducted by the study staff to:

Assess the effectiveness of BNR in these facilities (staff availability, realization of BNR for babies in need etc.)

Assess the theoretical knowledge of the facilities staff on BNR and practical capacity on BNR using the NeoNatalie simulator

Assess the maintenance of the BNR materiel provided to the sites

Monitor the BNR questionnaire filling out, necessary for problem quantification and impact evaluation.

Discuss the challenges and appreciable aspects of the implementation of the BNR

In addition, on-site training targeting sites staffs was conducted during these visits.

Data collection and statistical analysis

Data were collected during the initial training and a monitoring visit conducted one year after the initial training at the pilot sites. The multidisciplinary monitoring and evaluation team included an epidemiologist, a pediatrician and a gynecologist. We recorded information on the number of staff still present at a given pilot site, the number and functionality of the materials we gave as compared to the initial state, information about the number of on-site training conducted since the initial training using the list of attendance as proof of realization. A theoretical knowledge assessment using a 10 items

questionnaire and skills assessment of HBB scenario rating staffs performance in “fair”, “good” and “excellent” were done.

Staffs were also interviewed about their appreciation of the training, the tools they were given and difficulties they face in the implementation process during a group discussion using an interview guide. We also collected and reviewed the filled BNR questionnaire.

We conducted a descriptive univariate analysis of staff number, number of functioning BNR tools. Mean points during the initial training and the on-site monitoring were calculated. The percentage of filled BNR questionnaire was calculated as the number of filled questionnaire out the total of babies born in these facilities. T-test was used to compare average points before and after the training. The focus group discussions were broadly summarized into 2 categories: “appreciable aspects” and “challenges” of BNR implementation.

Ethical considerations

The study protocol has been approved by the Centre MURAZ institutional review board. The trainees consented to be interviewed for this study.

RESULTS

A total of 19 front-line birth attendants were trained in December 2014, and one year later, 32 % of this staff had been relocated outside of their initial site (Tableau I). The majority of them stayed in the Cascades region.

Tableau I: Evolution of trained BNR staff at site level, Cascades region, 2014.

Pilot site	Number of staffs trained	Number of staffs still present one year later
CSPS Flantama	2	2
CSPS secteur 8	2	2
CSPS de Kouèrè	2	1
CM de Niangoloko	2	1
CSPS de Sidéradougou	2	2
CSPS de Soubakaniédougou	2	1
Maternité CHR de Banfora	4	2
Pédiatrie CHR de Banfora	3	2

A pre/post training knowledge assessment showed 2 points increase (13 points out of 20 versus 15 points out of 20, $p < .05$). The knowledge of the front-line attendants trained in BNR one year later was still good with mean scores for the multiple-choice question test, bag-mask ventilation skills test of 15 points out of 20. But their skills were moderate during Objective Structured Clinical Examinations (OSCE) when simulating a resuscitation scene with the Neonathalie.

One year after the donation, all the health facilities reported at least one malfunctioning/missing item of the BNR kit. Penguins (the suctioning device) and bag-masks were the most frequently malfunctioning/missing item followed by penguins (Tableau II).

Tableau II: Distribution of the malfunctioning/missing BNR materials donated by study site, Cascades region, 2014.

Pilot site	Simulator	Bag and Masks*	Penguins*
CSPS Flantama	1	0	0
CSPS secteur 8	0	0	0
CSPS de Kouèrè	0	0	2
CSPS de Sidéradougou	0	1	2
CSPS de Soubakaniédougou	0	0	0
CM de Niangoloko	0	3	0
Maternité CHR de Banfora	0	1	1
Pédiatrie CHR de Banfora	0	1	1

*: The maternity and pediatrics wards of the Regional referral hospital received each 5 masks and 5 penguins

One year after the project onset, two out of the eight health facilities had conducted a refresher training (1-3 training sessions).

The study questionnaire filling out for 900 out of 9998 newborn (9.05%) born or admitted in these facilities.

The monitoring conducted one year later showed that only two pilot sites actually filled out the questionnaires and exclusively for resuscitated babies. (Table IV)

The interview with the staffs showed that they all appreciate the project overall that had strengthened their knowledge and skills in BNR. They acknowledge the added-value of the BNR items to the management of birth asphyxia. They particularly appreciated the suctioning device. The staff trained directly by the project pointed out the difficulty to involve their other colleagues for on-site training, BNR items maintenance and study questionnaires.

DISCUSSION

Our results showed that BNR training, according to the HBB curriculum, is appreciated by birth attendants and pediatrics staffs. But some challenges remain, regarding staff retention, regular training, BNR items maintenance, and filling out of questionnaires.

An important number of the trained workforce moved outside the study initial pilot sites. Similar concerns have been raised in Kenya [Rule et al., 2017a] and engaging the administration by presenting BNR results regularly to the improved staff retention. In our context, staff moved for many reasons, including career advancement, and family gathering. These reasons are more personal, and the decisions are made at the individual level making this recipe least applicable. This jeopardizes the sustainability of the project. Making sure to train people committed to neonatal health with no plan to move the next years could also improve retention of staff. Due to the vast complexity of this issue, envisioning how to equip the health facility of destination for those moved to another facility with BNR items so that they could contribute to the spreading of the skills among their new colleagues could also be of added value.

Almost all the pilot sites have at least one nonfunctioning or lacking BNR item.

Although assuring the correct functioning of the items is a key to achieving good resuscitation outcomes, this aspect has not been much discussed in the literature. Improper reprocessing (long lasting of some sensible items like masks in chloride water) of the items is one of the causes of early deterioration of the items [Eslami et al., 2015].

Also, one of our study site coordinators has donated a suctioning device to a nearby health facility. We also hypothesized that a lack of a clear maintenance schedule at the facility level and lack of incentives could also explain this fact. BNR according to the HBB curriculum, is a highly cost-effective intervention [Chaudhury et al., 2016; Vossius et al., 2014]initial training (including resuscitation equipment. Plans for equipment sustainability might be put in place through advocating at the local and national health authorities level and at beneficiary (population level).

BNR knowledge retention both immediately after and one year after the training session was good, but the skills retention was average. This has been emphasized in many studies [Bang et al., 2016; Kc et al., 2017; Wilson et al., 2017]000 infants die due to intrapartum-related complications. Implementation of Helping Babies Breathe (HBB). The decline in skills occurred for both extended initial training session (at least three days) like ours as well as refresher training session (1 day) [Ersdal et al., 2013].

BNR skills are easily acquired, but their retention over time is more challenging. Many reasons like the lack of professional support and infrequent resuscitation skills practice are commonly cited as barriers to skill retention after HBB training [Enweronu-Laryea, C et al., 2015]. Indeed, in our study, only two sites have proven that they conducted practice sessions since the initial training. This could be underreported as more sites reported having done some sessions but without any source of verification. The lack of documentation system to track for activities as noted by Rule in the African context could explain this contrast [Rule et al., 2017b]. Moreover, in some of our pilot sites, a lack of leadership of the trainees was also involved in this poor outcome. These trainees were nor the most graded agent nor the responsible of their wards and then incapable of gathering their colleagues for training purpose. One additional reason reported by the trainees is their colleagues' mistrust. Indeed, they reported that some of their colleagues thought they are paid by the project to conduct these BNR activities. We took the opportunity during the debriefing with all the staffs to make this point clear that no one is paid on-site for this activity and that it should be regarded as part of their duty from now. Our monitoring visits included a refresher training for those initiated to the HBB curriculum. Training of other sites staffs would help improve skills retention.

The rate of questionnaire filling out was very low. While all the pilot sites can welcome at least 50 newborns per months, only few questionnaires were filled and only for newborns who required resuscitation at birth. This situation conducted to a huge selection bias making it impossible to realize an assessment of the effect of the intervention one year later.

This could be explained by reasons like birth attendants perceiving this as an additional task for them while they are already overwhelmed by their routine work. The lack of knowledge in research and epidemiology and the lack of financial incentives might also be some of the reasons. A training on basic research methodology and the importance of data for intervention evaluation could help address this issue.

Overall, we think that most of the difficulties encountered are partly related to the lack of direct involvement of the regional health director office staff in the implementation of

the monitoring. This might cause fields staffs to think the project is outside the health system. For the next steps, people from the regional health office will be actively involved in all the steps of the project.

Strengths and limitations

This was the first intended evaluation of the effect of the HBB intervention on neonatal death from birth asphyxia in Burkina Faso one year after its implementation.

This evaluation could not properly done due to lack of comprehensive data. But instead, it pointed out some of the critical aspects of the implementation process that need to be carefully considered before a scale-up program could be rolled out.

The investigators who conducted the discussions are part of the top management of the local health system hierarchy. Interviewees might have elaborated on the positive aspects of the project and not its limits leading to a desirability bias. For example, talking about financial motivation is sometimes a taboo subject, but thanks to other experiences, we know that it's one of the critical aspects for interventions like ours to succeed.

CONCLUSION

BNR according the HBB curriculum is appreciated by health staffs and feasible in the Cascades region of Burkina Faso. But many challenges remain to be addressed for the effectiveness and the sustainability of this intervention.

Before scaling up the HBB intervention in Burkina Faso, there is a need for a better involvement of the regional health authorities, careful selection of the trainees, and training of staffs on basic research methodology.

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Competing interests

The authors have no conflict of interest to declare.

Authors' contributions

AHD, NP and NM designed the study.

AHD, TS, IO, CH and DY implemented the study.

TS drafted the manuscript and AHD, NP, NM, IO, CH and DY amended the manuscript.

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