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EFFICACY OF A DISCHARGE CHECKLIST FOR NEONATES IN REDUCING NEONATALMORBIDITY AND MORTALITY
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EFFICACY OF A DISCHARGE CHECKLIST FOR NEONATES IN REDUCING NEONATALMORBIDITY AND MORTALITY

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ABSTRACT

***Introduction*: In 2015, almost 1 million child deaths occurred in the first day of life while about 2 million deaths occurred in the first week. Most of these deaths are readily preventable or treatable with proven, cost-effective interventions like a checklist to reduce neonatal morbidity and mortality.**

***Objective*: The primary objective was to determine the efficacy of a standardized neonatal discharge checklist on the rate of hospitalization during the neonatal period at the Kenyatta National Hospital. The specific objective was to determine the acceptability of a structured postnatal discharge checklist among health care workers at Kenyatta National Hospital.**

***Study design setting and population*: A mixed method study that included the Quasi-experimental pre- post intervention design and focus group discussion on nurses was carried out in the post-natal wards at Kenyatta National Hospital. Neonates with no complications were enrolled for the study after consent was obtained.**

***Methodology*: Qualitative and quantitave methods were incorporated in this study. Structured questionnaires were administered to mothers in the postnatal ward and trained nurses on the checklist. Qualitative data was obtained using focus group discussions.**

Results: There was a trend noted for reduced hospitalization following introduction of the neonatal discharge checklist from 7.4% to 3.2% in the pre intervention and post intervention respectively a 56.7% reduction in hospitalization (p=0.06). There was significant improvement in knowledge on cord cleaning after the intervention (p =<0.001) as well as on identifying newborn

danger signs (p=0.005).
***Conclusion*: There was a trend for reduced hospitalization following implementation of the neonatal discharge checklist.**

INTRODUCTION

Globally, there has been a decline in the number of neonatal deaths from 5.1 million in 1990 to 2.7 million in 2015. The neonatal mortality decline in 1990–2015 was slower than that of post-neonatal under-five mortality (1-59 months): 47%, compared with 58% globally especially in low- and middle-income countries. Of the estimated 5.9 million child deaths in 2015, almost 1 million occurred in the first day of life while about 2 million deaths occurred in the first week.(1)
According to the Kenya Demographic Health Survey(KDHS) 2014, local data collected from the birth history of the women's questionnaire,)the neonatal mortality currently stands at 22 deaths per 1,000 live births while post neonatal mortality is 16 deaths per 1,000 live births. These estimates showed that 56% of infant deaths in Kenya occur during the first month of life. This is an indicator that progress is needed before Kenya achieves the Every Newborn Action Plan's goal of a neonatal mortality rate below 10 deaths per 1,000 live births by 2035 through effective cost friendly interventions(1)(2)

An effective and cost friendly intervention to help reduce neonatal morbidity and mortality could be in the form of a discharge checklist.

The importance of a checklist

The checklist can act as an important tool in error management across all high complex fields, contributing significantly in a decrease in the risk of costly mistakes and improving overall outcomes. Such benefits could also translate to improvement of delivery of patient care. Despite the demonstrated benefits of checklists in medicine and critical care, the integration of checklists into practice has not been as rapid and widespread as with other fields(3)

Identification and seeking of medical attention for illnesses in a newborn is very important, as the child may succumb quickly if the illness is not recognized and treated appropriately. The use of a postnatal discharge checklist has been introduced by World Health Organization(WHO) with the intention to reduce neonatal morbidity and mortality(4)

METHODOLOGY

Study Design and population: This was a mixed method study which was conducted using both the quasi-experimental pre- and post-intervention design and focus group discussions at the postnatal wards in Kenyatta National Hospital between December 2017 and February 2018. Three focus group discussions were conducted on the trained nurses during this period. The study population included 435 term neonates with no complications who were enrolled upon discharge. Their mothers were selected using simple random sampling. In the pre intervention phase 216 were recruited and 219 in the post intervention phase. A team of 16 nurses was enrolled to implement the discharge checklist and engaged through focus group discussions and surveys. The nurses enrolled underwent intense training on how to implement the discharge checklist

for three days. Hospital records and follow up phone calls made were used to determine those among the study population that had been hospitalized.

Study period

Pre-Implementation period: Neonates delivered at the facility and who were in the postnatal ward awaiting discharge were recruited for the study as per the inclusion criteria and informed consent was obtained from their mothers. The mothers were selected using simple random based sampling. The 216 neonates identified had a pre survey conducted by the principal investigator on their mothers upon discharge. Every neonate was then followed up for a period of 4 weeks between December 2017 and January 2018 through a phone call on Day 0, 48 hours, 2 weeks and 4 weeks. Data was then collected and analyzed on the number of neonates who were hospitalized during this period.

Intervention Period: A team of 16 nurses who work in the three postnatal wards underwent training after informed consent was obtained from them for three days on the implementation of the postnatal discharge checklist. The discharge checklist was then administered by the trained nurses between 8 am and 8pm daily and between 8am and 4pm on weekends. Thereafter the nurses had a survey and focus group discussions using a semi structured questionnaire conducted on them to determine the feasibility of the tool.

Post Intervention Period: The 219 neonates awaiting discharge from the postnatal wards were identified and recruited as per the inclusion criteria between January 2018 and February 2018. Implementation was done for four weeks on the mothers who had delivered during this period and they were followed up via phone call using a structured questionnaire on Day 0, 48 hours, 2 weeks and 4 weeks. At the end of the four weeks of the pre- and post-implementation of the checklist, there was documentation on the number of hospitalizations to any health facility

Data collection management and analysis: Data collected was entered, coded and cleaned in the excel software, Microsoft office Excel 2010 and then exported into IBM SPSS version 23.0 (SPSS Inc, USA). All statistical analysis was performed using the statistical package for social sciences (SPSS) software. Knowledge levels and importance was determined using a series of 10 questions on the postnatal discharge checklist. Perception towards postnatal discharge checklist was assessed using 10- statements on a 4-point Likert scale (Strongly Agree, Agree, Disagree and Strongly Disagree). Descriptive statistics was then computed to generate frequencies, means, medians and standard deviations. The cleaned data was then managed, stored and analyzed.

To qualitatively analyze the Focus Group Discussions (FGD), thematic analysis was performed, and common themes and direct quotations were extracted. This coded data was organized, and the information presented as narratives.

Ethical considerations: Ethical approval was sought from the Kenyatta National Hospital & University of Nairobi Ethics Research Committee (KNH-UoN ERC) before commencement of study to collect and analyze data collected in the study as part of the thesis dissertation. On follow up of the neonates, if any were noted to be ill, the mothers were referred to the nearest facility to them for further management.

RESULTS

Caregiver demographic characteristics: The majority of caregivers enrolled for the pre intervention phase of the study were young,

mean age ± (SD) was 26.3(5.058) and were comparable to those in the post intervention phase whose mean age ± (SD) was 26.09 (4.698). In both phases of the study, most caregivers who participated were educated beyond primary school with 80.6% in the pre intervention phase and 68.9 % in the post intervention phase respectively. More than 40% were primiparous in both phases of the study and this corresponds with the young age group.

Caregiver knowledge of newborn care: Of the 216 women surveyed in the pre intervention period, 207 (95.8%) had knowledge on breastfeeding while of the 219 surveyed in the post intervention period 216 (99.1%) were knowledgeable on breastfeeding. Knowledge on newborn hygiene on the other hand was relatively low between both groups of caregivers at 41 (19.0%) and 28 (13.0 %) in the pre- and post- intervention groups respectively. In the pre intervention phase 128(59.3%) had knowledge on cord care as compared to the 188 (85.8%) in the post intervention period.

Table 1

Comparison of Characteristics and Knowledge Pre and Post Intervention

Characteristics	Pre intervention		Post intervention		
	Frequency (N=216)	Percent (%)	Frequency (N=219)	Percent (%)	P
Demographic Characteristics					
Age (Years)					
≤25	106	49.1	105	47.9	0.85
>25	110	50.9	114	52.1	
Level of education					
Primary	42	19.4	68	31.1	**0.009**
Post primary	174	80.6	151	68.9	
Parity					
1	96	44.4	91	41.6	0.54
>1	120	55.6	128	58.4	
Infant Birth Weight (Kgs)					
≤3.0	106	49.1	105	47.9	0.33
>3.0	110	50.9	114	52.1	
Knowledge					
Danger signs					
Fever	145	67.4	174	79.8	**0.05**
Other symptoms	70	32.6	44	20.2	
Cord cleaning					
Yes	128	59.3	188	85.8	**<0.001**
No	88	40.7	31	14.2	
Breastfeeding					
Yes	207	95.8	216	99.1	0.058
No	9	4.2	2	0.9	
When first Immunization					
Yes	198	91.7	215	98.2	**<0.001**
Don't know	18	8.3	4	1.8	
What to do when you notice danger signs					
Go to hospital	189	91.3	198	93	0.439
Others	18	8.7	31	7	
When to wash the baby					
24 hours or one day after	41	19	28	13	0.106
Others	175	81	187	87	

Pre and Post intervention Comparison of Caregiver Characteristics and Knowledge: In the pre intervention phase of the study, there was a statistically significant association between age and identifying danger signs (fever) with those who were more than 25 years of age more likely to mention fever as one of the danger signs that they would look out for in the newborn. The majority of the caregivers, (91.3%) said that they would go to hospital when they noticed danger signs in the newborn. However, of the minority who said they would take other actions, older age was associated. There was an association between level of education and knowledge of the danger signs to observe in the newborn. Post primary education was associated with identifying the most common danger sign, fever. (p=0.014)

Table 2

Health care worker knowledge and practices on newborn care

HCW newborn care knowledge and practices (N=16)	**Strongly agree N(%)**	**Agree N(%)**
Mothers should be taught about newborn care	14(87.5)	2(12.5)
Clean cord with chlorhexidine	8(50.0)	4(25.0)
Breastfeed within 30 minutes of delivery	13(81.3)	3(18.7)
Advise mother to seek medical advice if baby refuses to breastfeed	14(87.5	2(12.5
Advise mother to seek medical advice if baby has not passed urine within 24 hours	13(81.3)	3(18.7)
Advise mother to seek medical advice if newborn has fever	13(81.3)	2(12.5)

All the healthcare workers agreed that: mothers should be taught about newborn care before discharge, should breastfeed within 30 minutes of delivery, should seek medical advice if baby refuses to feed or has not passed urine within 24 hours or has a fever. Of note is that 4 out of 16 health care workers did not agree to cord cleaning with chlorhexidine as compared to the 12 who agreed which is the standard practice. The response was based on the 4-point Likert scale with 4- strongly agree, 3- agree, 2- don't agree and 1-strongly don't agree.

Caregiver Education on Newborn care at discharge: Health care workers mainly talked to caregivers about breastfeeding exclusively for 6 months followed by observing the newborn for danger signs, with 9(60%) and 4(26.7%) respectively giving those as the first response. Other education items for the caregiver at discharge include newborn hygiene, cord care and immunization.

Qualitative Results:

Acceptability of neonatal discharge checklist

3 FGDs were held with nurses working in the postnatal unit at KNH to assess acceptability of the discharge checklist. Generally, health care workers agreed that the checklist is a great tool that can improve neonatal outcomes. This would be possible with regular training and a close collaboration with the paediatrics department in implementing it.

Checklist enhances practice

The health care workers were confident that the checklist would enhance their ability to

translate knowledge into practice on aspects of newborn care that may otherwise be forgotten especially considering the heavy workload. They also felt that the tool would help them provide knowledge in a clearly guided manner to the caregivers and this would improve the quality of the services that they offer at discharge of mothers and their newborns.

"We explain to the mothers on breastfeeding but not check if they are doing it appropriately because of the numbers." [HCW FGD 1]

"It's time saving, because you don't have to think of what to tell the mother, you just refer to the checklist" [HCW FGD 3]

Need for support to implement checklist

Nurses revealed that they need regular training/education to be able to implement the checklist. This would be through continuous medical education sessions and improving the tool to make it user friendly.

"It's too crowded; it should be shortened to at least one page and have check boxes to make it user friendly." [HCW FGD 2]

They also proposed that some of the items/supplies needed to provide the services be availed.

"If the hospital could provide chlorhexidine for the mothers in the wards upon discharge, it would help." [HCW FGD 3]

Checklist has potential for improving neonatal outcomes

Health care workers acknowledge that the neonatal discharge checklist would ensure they provide standardized care at discharge. Use of the checklist would also ensure the discharge process was comprehensive.

"It would reduce neonatal mortality because we are now able to give more focused information to the mothers, the counseling on hygiene for example would help reduce infections." [HCW FGD 1]

In some cases, the checklist was a source of new knowledge for health care workers that would enhance newborn care.

"I didn't know that the cord needs to be cleaned with chlorhexidine, we normally tell the mothers not to clean and just wait for it to heal." [HCW FGD 3]

Hospitalization

Overall, the response rate was 70% in the pre intervention phase and 80% in the post intervention period during the follow up phone calls to determine hospitalization.

Table 3

Follow-up response rate and Hospitalization rates

Day	Pre-Intervention neonatal follow up		Post-Intervention neonatal follow up	
	Response rate	Hospitalization	Response rate	Hospitalization
2	166 (76.9)	9 (5.4)	175 (79.9)	5 (2.8)
7	170 (78.7)	3 (1.8)	174 (79.5)	1 (0.6)
14	172 (79.6)	2 (1.2)	179 (81.7)	1 (0.6)
28	150 (69.4)	2 (1.2)	170 (77.6)	0 (0.0)

There was significant improvement in knowledge on cord cleaning after the intervention (p =<0.001) as well as on identifying newborn danger signs (p=0.005). Hospitalization rates were 7.4% and 3.2 % in the pre intervention and post intervention respectively a 56.7% drop in hospitalization. There was a trend for reduced hospitalization following introduction of the neonatal discharge checklist p=0.06 as shown in figure 4.

Table 4

Assessing the efficacy of a neonatal discharge checklist

Characteristics	**Pre intervention**		**Post intervention**		**P**
	Yes	**No**	**Yes**	**No**	
Hospitalization	16 (7.4)	200 (92.6)	7 (3.2)	212 (96.8)	0.061
Cord cleaning	128 (59.3)	88 (40.7)	188 (85.8)	31 (14.2)	<0.001
Breastfeeding	207 (95.8)	9 (4.2)	216 (99.1)	2 (0.9)	0.058
Characteristics	Pre intervention		Post intervention		P
	Fever	Other symptoms	Fever	Other symptoms	
Danger signs	145 (67.4)	70 (32.6)	174 (79.8)	44 (20.2)	0.005

DISCUSSION

With scarcity of data on the efficacy of a neonatal discharge checklist we sought to address this gap through evaluating knowledge that caregivers had before and after the nurses training on it. We also evaluated healthcare workers (nurses) knowledge on newborn care upon discharge as well as held focus group discussions to determine acceptability of the checklist. We assessed the efficacy of the neonatal discharge checklist on neonatal hospitalization rates.

The main areas assessed included knowledge on breastfeeding, cord care, identification of danger signs in the newborn, immunization, and newborn hygiene. In both phases of the study, we had a relatively young group of mothers who were mostly educated post primary and multiparous with the majority amongst the pre- intervention group at 80.6% compared to the post intervention group at 68.9%, which could be considered a confounder. Most caregivers had knowledge on breastfeeding compared to other aspects of newborn care being assessed. Various stakeholders including the Ministry of Health and most of the nurses being lactation experts could attribute this to the regular trainings on breastfeeding.

In both the pre intervention and post intervention phases, very few mothers (less than 20%) had knowledge on newborn hygiene. Most of the women interviewed said that they would only wash their newborn after the umbilical cord stump had healed while others had no knowledge on when to wash the newborn. This can be compared to the study by Obimbo et al 1999 where mothers had good knowledge on the need for hygiene when cutting the cord, had poor knowledge and practice in other aspects of cord care, and were afraid of handling the cord(5). In most cases, there may be an assumption that hygiene is a topic that everyone should be acquainted with and health care workers may not see the need to educate mothers. This clearly reflects the need to have a neonatal discharge checklist at hand to address this knowledge gap.

Fever was the commonly reported danger sign that mothers look out for in addition to the baby not breathing well or refusing to breastfeed. Notably, most of the mothers

reported that they would seek medical advice in the event they noticed a danger sign. This can be compared to a study by Gathoni*et al*of 2014 on knowledge of danger signs where the mothers were able to identify one danger sign but not familiar with the other common ones like difficulty in breathing and convulsions.

In both groups, the information on when the child should have the first immunization was adequate at above 90%. This was attributed to the efforts made by the government through the Ministry of Health to ensure regular immunization campaigns are held regularly through which in addition to providing immunization services, information is provided.

On comparing knowledge with demographic characteristics, during the pre-intervention phase, older caregivers were more likely to identify the commonly mentioned danger sign, fever. It was ascribed to the fact that they could have previously taken care of other children. This was consistent with findings in the post intervention phase.

The older caregivers were more likely to take other actions before seeking medical advice in the event they noticed danger signs, and these include tepid sponging and other forms of first aid. Post primary educated mothers were more likely to identify danger signs as compared to those not educated beyond primary and this would still be considered a confounder, as the mothers in the pre intervention were more educated.

Multiparous women were more likely to have knowledge on breastfeeding, cord care and danger signs to look out for in the pre-intervention phase whereas in the post intervention phase, only knowledge on danger signs was associated with multiparity. This related to prior experience caring for their other children.

On follow up, the mothers contacted on the phone were to determine if they had observed any danger signs and subsequent hospitalization of the neonates. During the 28-day period, they were contacted at four different time points during which any reported hospitalizations were documented. With fair response rate between 70% and 80%, hospitalization rates reduced in the post intervention period. This coupled with improved knowledge on cord care and identifying danger signs. This can be compared to Kihara et al 2014 that demonstrated increased rates in exclusive breastfeeding in the intervention group due to the phone-based counseling conducted.

Health care workers agreed that mothers need to be educated on newborn care upon discharge on various topics such as breastfeeding, identifying danger signs and newborn hygiene but it was worrying that some of them did not recommend use of chlorhexidine use for cord care. This significant gap in knowledge may have directly influenced the knowledge that they pass to caregivers and in turn improper cord care practices may be a source of neonatal infection. Obimbo et al 1999 demonstrated that the knowledge of a large proportion of HW was incorrect and outdated and recommended that health education on cord care be given at all levels of contact with mothers and that knowledge of all primary HW on cord care be updated (5) Throughout the years this issue has not been addressed as determined by the results shown in the study.

Shretha's PHD thesis of 2015, which conducted an education program on newborn care, revealed that the mother's knowledge improved which in turn improved infant care. Breastfeeding exclusively for 6 months and identification of danger signs were among the first responses given to educate mothers. This

resonates with the caregiver knowledge levels identified in both phases of the study, showing that mothers were more knowledgeable on breastfeeding and commonly identified fever as a danger sign.

Health care workers strongly felt that the use of a checklist would enhance their provision of neonatal discharge services. However, for the checklist implementation to be a success there is need for training and interdepartmental collaboration to support the process.They also felt that the neonatal discharge checklist would be a useful tool in ensuring a comprehensive discharge process for both the mother and baby thus highly likely to improve outcomes.

On the hospitalization rates, which a downward trend was demonstrated, and this could be attributed to the use of the discharge checklist. Ng'ang'a et al 2013 demonstrated that there was a significant number of well appearing term newborns with sepsis in the post-natal wards and as such require routine screening prior to discharge. On day 2 of follow up both in the pre- and post-intervention phase, hospitalization rates were recorded highest as compared to day 28 where in the post intervention phase where there were none recorded.

CONCLUSION

The study showed a trend in reduced hospitalization following the introduction of neonatal discharge checklist in the post-natal wards at Kenyatta National Hospital. Mothers interviewed for both the pre-intervention and post intervention phases of the study had limited knowledge on most of the aspects of newborn care like newborn hygiene, cord care and danger signs. The checklist on newborn care enhances experience and guarantees improved neonatal outcome. It is a great tool that not only saves health care workers time but also enables them to provide comprehensive information for the mother upon discharge.

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