STUDY REPORT:

Usefulness of the New-born Triage Checklist (NTC) as a Tool for Appropriately Identifying New-born Babies Who Need Specialized Care - Improving Health Care Provision (IHCP) Project in Tanzania.

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1. LIST OF ACRONYMS

CRT	Capillary Refill Time
DC	Data Collector
ENAP	Every Newborn Action Plan
GIZ	Deutsche Gesellschaft fuer Internationale Zusammenarbeit (giz) GmbH
IDI	In-Depth Interview
IHCP	Improving Health Care Provision
IMCH	Improving Maternal and Child Health
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MRCC	Medical Research Coordinating Committee
MRRH	Mbeya Regional Referral Hospital
NMR	Neonatal Mortality Rate
NTC	Newborn Triage Checklist
PO -RALG	Regional Administration and Local Government
SDG	Sustainable Developmental Goals
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

2. EXECUTIVE SUMMARY

2.1. Study background and rationale

Reducing neonatal mortality is an essential part of the third Sustainable Development Goal (SDG), to end preventable child deaths. The first 24 hours of life are regarded as the precious hours to save the life of a newborn; about 50% of newborn deaths occur within 24 hours of life with some of the causes of such deaths being preventable or treatable. According to WHO, in its article titled '*Newborn: improving survival and well-being*' published on 19th Sep 2020, the majority (75%) of all neonatal deaths in 2019 globally occurred during the first week of life, and about 1 million newborns died within the first 24 hours (1). Hence, increasing attention to this critical early period in a new-born's life may significantly reduce neonatal mortality.

With support from the German Government, GIZ is currently implementing a project titled '*Improving Health Care Provision (IHCP)*' at selected facilities in Mbeya and Tanga regions of Tanzania. The project intends among other things, to contribute to enhancing and expanding obstetric and new-born care services and establish further care for critically sick babies. Through the programme, providers will be trained, mentored and their performance monitored during supportive supervision. The programme as well provides selected equipment for maternal, new-born care and Family Planning (according to needs). Other support areas include strengthening referral linkages and improving practices for infection prevention and control.

From 2015 to 2018, GIZ implemented another project titled '*Improving Maternal and Child Health (IMCH)*' at selected hospitals in Lindi and Mtwara regions of Tanzania, aimed at improving the quality of emergency obstetric and new-born care. As part of interventions under that project, selected hospitals were supported to establish new-born care units together with training of relevant staff and provision of essential equipment and supplies. Moreover, paediatricians overseeing neonatal care wards in Lindi and Mtwara developed, the New-born Triage Checklist (NTC), which is a simple tool that uses a checklist system for assessing the health of every new-born after delivery at specific points of time for a total of three times within the first 24 hours of life. The latter is done by examining the baby for given criteria in the checklist, which are danger signs and point at the most common neonatal diagnoses and main causes for neonatal deaths. The NTC then stratifies babies into colour-coded risk categories (red for "high risk", yellow for "at risk" and green for "no risk"). The colour code then leads the health care provider to the appropriate action to be taken, to ease and speed the process of decision making and ensure appropriate and timely management and referral/transfer for sick neonates. Preliminary results from implementation of the IMCH project, including the NTC, showed a significant reduction of maternal mortality related to complications from 2.4 % to 1.1 % while proportion of new-born deaths went down from 32 to 20 per 1,000 live births over the same period. Secondary to these promising findings, the NTC was scaled up to selected health facilities in Mbeya and Tanga as part of interventions under the new project "*Improving Health Care Provision (IHCP)*", and was incorporated with some minor amendments into the National Guideline for Neonatal Care (launched in 2019) as a national tool for close observation of new-borns within the first 24 hours of life.

Despite that the New-born Triage Checklist (NTC) has been used for several years now there has never been any research conducted on the NTC and it has not been evaluated for its effectiveness in differentiating between healthy new-borns and new-borns in need for further observation or treatment. Further a review of literature reveals a scarcity of information related to new-born triage. This study was conducted at Mbeya referral hospital, which is among the hospitals that have adopted the NTC, to assess the usefulness of the NTC as a tool for appropriately identifying sick new-born babies who need specialized care, including transfer/referrals.

2.2. Study methods

This was a mixed methods study comprising both quantitative and qualitative parts. The quantitative part involved a review of medical records, including labour/delivery registers as well as a sample of filled NTC cards, for infants who were born in three selected study periods of Apr 2018, Apr 2019 and Apr 2020. The extracted information was entered into a Case Review Form (CRF), which was filled for each newborn. The quantitative part of the study was aimed at establishing the extent to that NTC cards are being used by service providers at Mbeya Regional Referral Hospital (MRRH), errors committed by service providers in filling the cards, information completeness as well as the action taken for sick new-borns. Actions that were relevant for this study were; whether the newborn was transferred/referred to the newborn care unit (NCU), kept under extended observation in maternity ward or was discharged.

Qualitative interviews were conducted among service providers using the NTC cards at MRRH, their supervisors as well as members of the hospital management team relevant for the NTC intervention. The qualitative interviews were aimed at exploring respondents' opinions on the usefulness of the NTC card in correctly identifying normal children as well as children needing further care, user-friendliness of the NTC tool, availability of the tool, archiving of used cards, use of data in the filled cards as well as any challenges related to use and management of the NTCs.

2.3. Key findings

Perception on NTC Usefulness
- All respondents for this study, including service providers and service managers, perceived the NTC as an extremely helpful tool in guiding services offered to the newborns. One service manager added that in the past service providers used to only focus on the mother and did not pay any attention to the newborns.
- In addition to reminding them of what needs to be examined, some service providers appreciated the fact that the NTC also offered them a reference of what is normal when it comes to newborn vital signs.
- Some service providers and service managers perceived the NTC card as having provided an opportunity for proper documentation of the baby's condition both at birth and during its stay in the ward.
- Both service providers and managers felt that the NTC has greatly facilitated early identification of newborn problems that would otherwise be missed. The latter was reported having facilitated timely management of such conditions and thereby preventing complications and deaths of newborns.
- Establishment of the timing of the newborn problem was also noted to have created a means for accountability, facilitated clearing of misunderstanding and prevented finger pointing among service providers when the baby's condition changed.

Appropriate Use of NTC Cards
- Despite the perceived usefulness of the NTC card among respondents for this study, findings from the quantitative component of this study established only around half 520 (52.3%) of all babies born in the selected study periods having been assessed using the NTC.
- A review of filled NTC cards established that the first assessment was always completed while a significant number of newborns did not receive the subsequent assessments.
- The observation chart was almost never used, with only one of the reviewed NTC cards (of a baby born in Apr 2019) having the observational chart filled.
- This study was not designed to assess correctness of the information in the filled NTC cards; however, a few issues were noted, including checking of multiple options (where only one option was required) and ticking options for both danger and no danger signs under the same variable.

Barriers for Appropriate Use of NTC Cards

- The most-commonly reported barrier for filling NTC cards was the high workload among limited available number of staff.
- Premature discharge (prior 24 hours) of both the mother and her baby secondary to the limited space in the wards made it impossible to complete all the three assessments.
- There was also reported a notion that some service providers, particularly those who were more active in filling the NTC cards, had been secretly trained and are being paid to conduct assessments of newborns.
- Other barriers for filling NTC cards noted were limited orientation of service providers on the importance of filling NTC card for every newborn and ignorance among some service providers. Doctors were noted perceiving filling of NTCs as the nurses' role.
- None of the respondent reported lack of skills and availability of NTC cards as barriers for filling NTC cards. Findings indicated that the NTC card was perceived as being straight forward and self-explanatory.

Challenges related to handling of filled NTC cards.
- Lack of specific procedures for storing/handling filled NTC cards were noted as among challenges facing implementation of the NTC intervention.
- Another service manager noted a challenge related to misuse of new NTC cards. She said when some service providers made a minor mistake during filling of the card, they would tear the card, throw it away, and take a new one, instead of just crossing the mistake and re-using the same card, a challenge she perceived as leading to loss of many cards.
- Respondents perceived NTC cards made of hard materials as easier to handle and store as compared to the soft copies.

Facilitators and motivators for proper filling of NTC cards.
- The most-commonly reported facilitator/motivator for service providers to fill NTCs was frequent emphasis from service managers/supervisors in the form of reminders on the importance of filling the NTC card for every newborn.
- Several respondents said use of information in the filled NTC cards as a reference when something wrong happened to the newborns was a motivating factor among service providers to fill the NTC cards.
- Further, the design of the NTC card was perceived by all service providers and service managers as being very user-friendly. Respondents added that, the items were easily understandable, its filling did not take time as all was required was put a tick under relevant boxes, and the three different colors made it easier for them to make conclusion regarding the baby's condition.

2.3. Conclusions
Generally, this study established a consensus among all service providers and service managers that, when appropriately and effectively used, the NTC is a very helpful tool in guiding services offered to the newborns. On the other hand, the use of NTC to assess newborns for danger signs at MRRH is still suboptimal with only around half of all newborns currently being assessed using the NTC. When service providers conducted the assessments, information incompleteness was rarely noted. Some filled NTCs had minor errors, including having more than one option checked in scenarios where only one option was supposed to be checked and some service providers checking for both the presence of danger and no danger signs under the same variable. The latter errors were also noted rarely. The finding that the observation chart was almost never used calls for attention around this section of the NTC.

The most-commonly reported barrier for filling NTC cards was the high workload among the limited available number of staff leading to some newborns not having a filled NTC card at all, skipping of subsequent assessments, and more commonly, service providers not being able to adhere to the assessment schedule depicted on the NTC card. Other reported barriers for filling NTC cards were limited orientation of service providers on the importance of filling NTC card for every newborn and

ignorance among some service providers. On a positive note, the NTC card was generally perceived as being easy to use and its filling straightforward. Additionally, its design was perceived as being user-friendly, including that, items were easily understandable, filling of the card did not take time, and all respondents perceived the three different colour codes as making it easier for them to make conclusion regarding the baby's condition.

Frequent reminders and emphasis from service managers was deemed crucial in facilitating service providers filling of NTC cards for every newborn. Additionally, findings suggest that use of the information in the filled in NTCs as part of auditing process whenever something wrong happens to a newborn further facilitates effective filling of NTCs.

2.4. Recommendations

Recommendations on the design of the NTC card

1. Many service provides said they could not remember timing of conducting the three individual assessment for each newborn, hence, we recommend the use key moments in the newborn's continuum of care as timing for conducting the various assessments in the NTC instead of hours i.e., first assessment may be conducted in the labour ward, second assessment may be conducted when the child is being received in the post-natal / NCU ward, and 3rd assessment just prior discharge. Since a significant number of newborns are usually discharged before 24 hours, conducting assessments at the three recommended time points may facilitate all newborns to receive all the 3 assessments despite the length of their stay in the facility.

2. Since, the NTC card was deemed to aid accountability when something wrong happens to the baby, adding a space for a signature of the service provider under each assessment may further aid accountability.

3. The study team also recommend adding the variables below to aid effective monitoring and evaluation of the NTC intervention in future:

    a. "***Type of delivery***" – it was mentioned in this study that most of the newborns without a filled NTC were those born via C/S – hence, this information could help ascertain whether this was true. Also, babies born via C/S may have different health risks, compared to those born vaginally.

    a. "***Time of birth***": - this variable would facilitate ascertaining the time lag between childbirth and the first assessment.

    b. "***Time of discharge***" – this variable would facilitate knowing the length of time the newborn stayed prior being discharged.

    c. "***Date under each individual assessment***" – the study team faced a challenge in calculating the number of hours that elapsed between assessment because the dates for subsequent assessments were not noted. It would be great to add date of the assessments as there could be a change of date if the baby stayed over mid-night.

4. If feasible all abbreviations in the NTC card, e.g., CRT should be expanded to facilitate easy understanding in case of NTC use by providers not already oriented.

5. The programme may need to consider adding some of the danger signs / newborn assessment criteria suggested by respondents for this study, which are currently missing.

6. Service providers recommended NTC cards to be printed on hard papers and not soft papers, and always to be colour coded.

7. Lastly, service providers recommended putting the NTC card in electronic system as way of tackling the challenge of mishandling of both plain and filled NTC cards.

8.2.2. Recommendations to facilitate effective implementation of the NTC intervention.

1. Findings suggests that the limited use of NTC cards established in this study is primarily due to lack of orientation among service providers on the importance (benefits / impact) of NTC rather than lack of skills on how to fill NTC cards. All service providers and service managers felt that there was a need for frequent training/orientation of service providers on the NTC card along with sensitization on the importance of filling NTC cards for every newborn. It was particularly deemed that more sensitization is needed among medical doctors who perceived filling of NTC cards as a nurses' role.

2. Findings further established that there are a significant number of providers that have not received any orientation on the use of NTC card at MRRH while at the same time it was reported that there are service providers trained to offer mentorship to other facilities. These may be utilized to offer orientation at MRRH as well.

3. Service providers orientation on the NTC intervention may also incorporate effective measures for handling both plain and filled NTC cards. If such measures are not yet in place, they should be established in collaboration with service providers themselves.

4. The programme may consider a refresher training on the specific criteria mentioned in this study as having clarity issues.

5. We recommend that there should be regular performance reviews on the use of NTC cards. The review may be as simple as total NTC cards filled versus total live births. One service provider recommended incorporating updates on NTC cards in routine morning meetings where service providers would report on the number of live births, how many newborns had danger signs/were referred to NCU and how many were in good health (information that would come from findings from the NTC assessments for each newborn).

6. Lastly, if enough care is not taken, the reported practices where a busy nurse observes several babies, continues doing other tasks, and later sits down and fills several NTC cards may potentially lead to exchanging baby's findings.

Recommendations for further studies

1. Findings from this study suggests that the NTC is a highly potential intervention for reducing neonatal deaths, which is still a major challenge in Tanzania as well as in many other African countries. A well-designed study involving multiple health care delivery levels (e.g., including health centre and dispensary level), may facilitate generation of strong evidence on the impact of this intervention. Specifically, it may be of interest to learn how the NTC intervention works at lower-level facilities without a neonatal care unit (NCU).

3. STUDY BACKGROUND AND RATIONALE

Reducing neonatal mortality is an essential part of the third Sustainable Development Goal (SDG), to end preventable child deaths. While there have been significant improvements in the number of infant and child deaths in many countries, the number of neonatal deaths has remained stable (1-4). Globally 2.4 million children died in the first month of life in 2019, an average of 7000 newborn deaths every day, and amounting to 47% of all child deaths under the age of 5-years (4). Sub-Saharan Africa had the highest neonatal mortality rate in 2019 at 27 deaths per 1,000 live births, followed by Central and Southern Asia with 24 deaths per 1,000 live births (4). Regardless of being among regions with the lowest under-five mortality rates, most of all under-five deaths in Europe and Northern America also occur during neonatal period (4). In Tanzania, neonatal mortality rate remained unchanged between 2004 and 2016 while post neonatal mortality and child mortality rates have halved within the same period (1, 5). In fact, Tanzania is among 10 countries with the highest neonatal mortality rate worldwide (4).

According to WHO's article titled '*Newborn: improving survival and well-being*' published on 19th Sep 2020, the most common causes of neonatal deaths worldwide are: preterm birth, intrapartum-related complications (birth asphyxia), infections and birth defects (4). While gaps in registration and reporting provide incomplete data in Tanzania, three similar conditions: severe infections; complications of preterm birth; and asphyxia are responsible for 85 % of newborn deaths in Tanzania (6). Hence, focusing on these conditions may significantly reduce neonatal mortality.

Further, evidence shows that over 75 % of new-born deaths occur within the first week of life with 50 % of them happening within the first 24 hours after birth (4). It is estimated that 1,049,300 children die each year on their first day of life, representing 15 percent of all deaths of children under 5 each year (7). In line with above evidence, a study done to estimate neonatal mortality, particularly within 24 hours of birth, in six low- and lower-middle-income countries found that overall, a little under half of all neonatal deaths in the study populations occurred within 24 hours of birth – the figure ranged from 36 % to 66 % across the study sites – and about one in three neonatal deaths occurred within six hours of birth (8). In Tanzania, it is estimated that, 39,000 babies die annually, with nearly half of them (17,000) dying during their first day of life (6). This makes the day a child is born by far the most dangerous day in that child's life and hence, increasing attention to this critical early period in a new-born's life may help save lives of many newborns.

As elaborated by UNICEF's report titled '*Ending preventable newborn deaths and stillbirths by 2030*' published in July 2020, interventions targeting improvements of the following four indicators can significantly reduce new-born deaths, in particular those occurring during the first 24 hours of life (9). These indicators are 1) four or more antenatal care contacts, 2) births attended by skilled health personnel, 3) postnatal care within 2 days and, 4) care for both small and sick newborns.

Various interventions are in place in many countries targeting improvements of the four indicators above. One of the interventions in place in Tanzania, though at a very small scale, is the use of Newborn Triage Checklist (NTC), a tool for assessing newborns within the first 24 (to 48 hours) of life and classifying them into three categories namely 'high risk', 'at risk' and 'no risk'. The classifications then lead the health care provider to the appropriate action to be taken, to ease and speed up the process of decision making and ensure that appropriate pre-referral management and timely transfer/referral for sick neonates is made.

3.1. What is a checklist?

A checklist is a list of action items, tasks or behaviours arranged in a consistent manner, which allows the evaluator to record the presence or absence of the individual items listed (10). Typically, each item is checked off as it is completed, verified, identified or answered, by placing a mark in a designated space (10). A sound checklist highlights the essential criteria that should be considered in a particular

area and helps the user not forget important criteria, achieve standardization of a process, and in so doing it enhances an assessment's objectivity and reproducibility (10).

Checklists are used in both medical and non-medical industries as cognitive aids to guide users through accurate task completion, and they have proven effective in various aspects of performance improvement and error prevention and management (11-14). High intensity fields of work, such as the airline industry and the military, have been employing checklists for a while to decrease errors of omission, improper implementation of procedures and protocols, and to decrease human error under stressful conditions (11, 12). Similar to flight crews and military personnel, health service providers, particularly those working in low resource health care systems, must often analyse and manage patients under demanding and stressful conditions. It is in these lines that checklists are currently being employed regularly in the medical field to facilitate accurate decision making of service providers, reduce the frequency of errors of omission, create reliable and reproducible clinical evaluations and improve overall quality of care received by patients (15-17).

3.2. Introduction to the new-born triage checklist (NTC) in Tanzania

Between 2015 and 2018, GIZ implemented a project titled 'Improving Maternal and Child Health (IMCH)' at selected hospitals in Lindi and Mtwara regions of Tanzania, aimed at improving the quality of emergency obstetric and new-born care. As part of interventions under that project, selected hospitals were supported to establish new-born care units together with training of relevant staff and provision of essential equipment and supplies. Moreover, paediatricians overseeing neonatal care wards in Lindi and Mtwara developed the New-born Triage Checklist (NTC), which is a simple tool that uses a checklist system for assessing the health of every new-born after delivery at specific points of time for a total of three times (60 – 90 min, 4 – 8 hours and 20 – 24 hours after birth) within the first 24 hours of life. The latter is done by examining the baby for given criteria in the checklist, which are danger signs and point at the most common neonatal diagnoses and main causes for neonatal deaths. The NTC then stratifies babies into colour-coded risk categories (red for "high risk", yellow for "at risk" and green for "no risk"). The colour code leads the health care provider to the appropriate action to be taken, to ease and speed the process of decision making and ensure appropriate and timely management and referral/transfer for sick neonates (*refer appendix 01 for an example of the NTC*).

Preliminary results from implementation of the IMCH project, including the NTC, at the intervention facilities in Lindi and Mtwara showed a significant reduction of maternal mortality related to complications from 2.4 % to 1.1 % while proportion of new-born deaths went down from 32 to 20 per 1,000 live births over the same period. Secondary to these promising findings, the NTC was scaled up to selected health facilities in Mbeya and Tanga as part of interventions under the new project "*Improving Health Care Provision (IHCP)*, also supported by the German Government, GIZ. The NTC was also incorporated with some minor amendments into the National Guideline for Neonatal Care (launched in 2019) as a national tool for close observation of new-borns within the first 24 hours of life.

3.3. Rationale for this study

Despite that the New-born Triage Checklist (NTC) has been used for several years now there has never been any research conducted on the NTC and it has not been evaluated for its effectiveness in differentiating between healthy new-borns and new-borns in need for further observation or treatment. Further a review of literature reveals a scarcity of information related to new-born triage. The rationale of this study was to conduct research (of limited scale) on the NTC to assess its usefulness as a tool for appropriately identifying normal babies as well as sick new-born babies who need further care.

4. STUDY OBJECTIVES

4.1. Overall study objective

The overall objective for this study was to assess usefulness of the NTC as a tool for appropriately identifying healthy new-born babies as well as newborn babies who need closer observation or further care, including transfer/referrals.

4.2. Specific objectives

The specific objectives were:

1. To assess the *extent to that NTC cards are being used* by service providers at MRRH to assess new-born babies for danger signs.

2. *To assess correct use of the NTC cards in assessing new-born babies for danger signs, including completeness of the filled cards.*

3. To document *factors associated with use and non-use of NTC cards* among babies born at MRRH, including motivating factors as well as facilitators and barriers for using the NTC cards.

4. To document actions taken by service providers for babies identified through NTC as sick or at risk[1] .

5. To explore *health care workers experiences* with the use of NTC

6. To *compare rates of in-facility newborn deaths* three years pre vs. three years post the NTC intervention.

5. METHODOLOGY

5.1. Study design

This was a cross-sectional mixed methods study that utilized both quantitative and qualitative research methods.

5.2. Study site

This study was conducted at Mbeya Regional Referral Hospital (MRRH) located in Forest area within Mbeya City Council. Specifically, this study was conducted in the maternity and labour wards of MRRH. Data was also collected from the neonatal care unit (NCU). The number of deliveries per month at MRRH ranges between around 200 to 400 (average 300 per month). MRRH was selected for this study because it is among a few facilities that the use of NTC was well established at the time the study was conducted (among facilities currently supported by GIZ). The NTC intervention was initiated in Feb 2018, approximately one year after establishing a neonatal care unit (NCU).

5.3. Study population

The study populations included:
    a. Newborn babies delivered at MRRH for 3 years period preceding the implementation of NTC (2015, 2016 and 2017) and 3 years following implementation of NTC (2018, 2019, and 2020).

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[1] The only actions relevant for this study include; whether the sick newborn was transferred/referred to a facility with a newborn care unit (NCU) and whether the baby received appropriate pre-referral management as required for the baby's condition.

b. Service providers for newborn babies at MRRH, and
c. Service managers overseeing service provision to newborn babies at MRRH.

5.3.1. Inclusion criteria

Newborn babies:
- Newborn babies born alive at MRRH between 2015 to 2020.

Service providers:
- Service providers who had used the NTC for newborn assessment at MRRH at any period.

Service managers/supervisors
- Members of the regional, district and/or hospital management team who were aware of the NTC intervention at MRRH and who had been conducting supportive supervision and/or mentorship of service providers working in the maternity, labour and/or neonatal care units.
- Any other members of the hospital management team who are aware of the NTC and who play any role in managing and/or supervising quality of care given to the newborn babies at MRRH.

5.3.2. Exclusion criteria
- Newborn babies born elsewhere and referred to MRRH.
- Service providers who have never used the NTC.
- Members of the regional, district and/or hospital management team who are unaware of the NTC.

5.4. Sample size consideration

Since this was a cross-section study[2], we used the formula below for estimating the maximum sample size of newborn babies needed for this study.

The sample size formula for a single cross-sectional survey is:

$$n = \frac{(Z)^2 \times P(1-P)}{d^2}$$

Where:

Z= value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

P = Estimate of the expected proportion (since there were no similar studies done on the same topic, we have used p=0.5 to give us the maximum sample size).

d= Desired level of absolute precision = 0.05

Hence:

$$\text{Sample size (n)} = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2}$$

$$n = 384 \text{ babies}$$

Hence, we needed a sample size of 384 babies for this study.

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[2] In a **cross-sectional study**, the investigator measures the outcome and the exposures in the **study** participants at the same time.

5.5. Data collection

5.5.1. Quantitative data collection

The quantitative component of this study involved the following:
- A review of patient records, including birth registers and filled NTC cards of newborns delivered at MRRH.
- We used information of babies born in the three specified time periods below to answer the study objectives no. 1, 2, and 4:
  - o Data point 01: Apr 2018 (this represents early months of NTC intervention at MRRH)
  - o Data point 02: Apr 2019 (this represents a period just over a year after the NTC intervention was introduced at MRRH)
  - o Data point 03: Apr 2020 (this represents two years after the NTC intervention was introduced).
- We used routine service provision data (DHIS2) for all babies born at MRRH during three years preceding the NTC intervention (2015, 2016 & 2017) and three years after the NTC intervention to answer study objective no. 6 (further detailed below).

Quantitative data collection for answering objective no. 1, 2, and 4.
The main sources of data for answering study objectives no. 1, 2 and 4 were the labour and delivery (L&D) registers, and NTC cards.

To answer the study objective no. 1(*to assess the extent that NTC cards are being used by care providers at MRRH to assess new-born babies for danger signs*), we obtained, from the L&D registers, a list of all babies delivered in the study targeted period of Apr 2018, Apr 2019 and Apr 2020. This was followed by excluding all still births to only remain with live births for each month. The latter was followed by establishing whether a NTC was completed for each baby noted as a live birth.

To answer study objective no. 2 (*to assess correct use of the NTC cards in assessing new-born babies for danger signs, including completeness of the filled cards*), a sample of NTC cards were reviewed for both completeness and accuracy.
Based on our targeted sample size of 384, the study team had planned on reviewing 128 NTCs from each of the three targeted study periods. However, since the number of filled NTCs differed for each targeted period, the team obtained the sample as described below:
- ✓ For Apr 2018, there were only 79 NTCs available, hence, these were all included in the review since they were less than the targeted sample.
- ✓ A total of 248 & 181 filled NTCs were available for Apr 2019 and Apr 2020, respectively. Hence, a sample of filled NTCs was selected from each of these two periods using probability proportional to size (PPP) sampling.
- ✓ For Apr 2019, the team skipped one NTC after every 2 NTCs that were included in the study which led to a total of 165 NTCs that were included in the study.
- ✓ For Apr 2020, the team skipped one NTC after every 5 NTCs that were included in the study which resulted into a total of 148 NTCs that were included in the study.
- ✓ We hence ended up with a total sample size of ***392 NTCs*** from all three targeted study periods (79 in Apr 2018, 165 from Apr 2019 and 148 from Apr 2020).

To answer study objective no. 4 (*to document actions taken by care providers for babies identified through NTC as sick or at risk*): We used filled information in the NTCs to document: 1) whether the newborn was transferred to the neonatal care unit (NCU), 2) was kept under observation for 48 hrs (using the observation chart), or 3) was discharged. Filled NTCs for newborns that were referred to the NCU were kept separately, hence, these were easily identified. For the second action, we reviewed whether the 48 hrs observation chart on the NTCs was completed (for newborns in the yellow band). For newborns that were discharged, this was also easily identified from the filled NTC cards.

To answer study objective no. 6 (*to compare rates of in-facility newborn deaths* three years pre vs. three years post the NTC intervention), we first attempted to obtain perinatal mortality data from the hospital registers (the study team was advised that this was the most accurate source, since some data is never entered into the system). However, access to this source of information proved to be a challenge after some registers could not be retrieved. Hence, we worked with the regional HMIS focal person who provided the team with this information from the DHIS2 data.

5.5.2. Qualitative data collection

Qualitative interviews were aimed at answering **study objective no. 3** (*to document factors associated with use and non-use of NTC cards among babies born at MRRH, including motivating factors as well as facilitators and barriers for using the NTC cards*) and **study objective no. 5** (*to explore health care workers experiences with the use of NTC*). As noted under table 1 above, we conducted a total of 19 IDIs, 5 with service managers and 14 with service providers.

All interviews were conducted at Mbeya regional referral hospital (MRRH) in the respondent's working spaces e.g., in offices or hospital wards, they were all conducted in Swahili (the national language), and they were all audio-recorded. The interviews took between 30-75 min.

Almost all participants were recruited through the in-charges of the departments from where respondents were working with exception of 2 services managers that were recruited though GIZ staff on the ground. Table 2 below summarizes the number of IDIs conducted from the various hospital departments. Further details of respondents are provided under appendix no. 2.

Table 2. Number of IDIs conducted in the various hospital departments

Department	Number of IDIs
Labour ward	5
Postnatal ward	5
Newborn Intensive Care Unit (NICU)	4
Services Managers	5
Total	**19**

In line with the study objectives, the qualitative interviews were aimed at exploring respondents' opinions on the usefulness of the NTC cards in correctly identifying children needing further care (including transfer/referrals), motivation as well as barriers and facilitators for using the NTC tool, user-friendliness of the tool as well as any challenges related to NTC use. Questions in the qualitative interview guides as well explored other aspects of the NTC intervention, including how service providers feel about the training they received on the use of the checklist, availability and usefulness of supportive supervision, etc. Qualitative interviews also explored whether there were any other newborn interventions at MRRH during the three years preceding and three years after the introduction of the NTC intervention.

5.6. Data management

5.6.1. Quantitative data management in the field
Quantitative data was collected on paper forms (CRFs). Paper and not electronic forms were used for quantitative data collection because the information inquired involved a review of various patients' records, which were obtained from different sources, hence, paper forms were deemed more flexible and feasible. To ensure completeness of collected information, DCs were instructed to review all filled CRFs immediately after completing each case and prior to leaving the hospital each day.

5.6.2. Quantitative data entry

We utilized kobo toolbox for entering paper CRFs into an electronic system. The electronic data form comprised in-built data validity and consistency checks to ensure that entered data were within allowable ranges. In addition, skipping patterns were employed to prevent data clerks from filling in questions that are to be skipped based on previous responses.

Up on completion of data entry activities, electronic data was downloaded from Kobo Toolbox database and further cleaned off inconsistencies. Clean data was then transferred to SPSS program (version 25) that was utilized for data analysis (further described below).

5.6.3. Quantitative data analysis

SPSS program (version 25) was used for data analysis. Descriptive statistics were used to ascertain the proportion of new-born babies assessed using a NTC card (objective no. 1), the proportion of NTC cards that are correctly filled (objective no. 2a), as well as the frequency of the various errors committed by service providers in filling the NTC cards (objective no. 2b). Cross tabulations were used to compare the proportion of newborns with filled NTCs during the three study periods as well as the number of newborn deaths at the MRRH during the three years preceding vs. three years after the NTC intervention was introduced (objective no. 6). The Chi-square test was performed to ascertain the statistical significance of the observed differences during the three study periods.

5.7. Qualitative Data management

All IDIs were audio recorded with consent from the study respondents. Trained and experienced transcribers transcribed the digitally recorded IDIs directly into English. Trained research team members verified all the transcripts against the original audios to ensure that the transcriptions and translations were accurate. After transcript validation, the team leader imported all transcripts into a qualitative software ATLAS.ti (Version 7.0), which was utilized for data analysis.

Data analysis began by the team leader developing a preliminary codebook that comprised pre-set codes derived from questions in the data collection tools as well as manual coding of two transcripts. The team leader along with four coders then piloted the preliminary codebook on a few transcripts under each respondent category. As part of codebook piloting, under each respondent category, coders coded a similar transcript and compared the assigned codes under similar text segments, resolved any disagreements, refined or merged the pre-set codes and/or proposed new codes. This process was repeated with different transcripts under the same respondent category until when there was minimal or no disagreements in the application of codes among all coders at which point actual coding of transcripts was initiated. The four coders that participated in the codebook piloting conducted the actual coding of qualitative data materials.

The coding process was immediately followed by analysis of the coded data materials. Analysis of the qualitative data materials was guided by the key qualitative research questions and it involved exploration of the information pertaining to the research questions coming out under the various codes. Data analysis also involved exploration of differences in responses among service providers and service managers. Data analysis was followed by merging information under related codes into bigger themes and sub-themes that comprised sections for this study report.

5.8. Methodological limitations and other challenges faced during study implementation.

The study team faced the following challenges and methodological limitations during implementation of this study:

1. The NTC intervention was not designed with its monitoring and evaluation in mind, hence, some key variables that could add value to this evaluation were missing. For example:

a. The absence of *time of childbirth* hindered the study team from ascertaining the average time between childbirth and when the babies received the first assessment.

b. Date of subsequent assessments was missing and made it difficult to correctly calculate the number of hours that elapsed between the first and second, as well as the second and third assessments. The latter was in particular a challenge for children who stayed past midnight.

2. The study team was not able to ascertain whether missing NTC cards for live births were a result of the NTC card not having been filled completely or having been filled but misplaced - this has implication for findings under study objective no. 1.

3. The study team faced some challenges in obtaining the number of babies that died at MRRH secondary to challenges accessing registers for previous years. We ended up obtaining this information from DHIS2 system, however, the HMIS focal person who shared this data admitted that the number of deaths may not have all been captured. He was certain that all deaths for the year 2020 were entered into the system but not for the previous years. Also, despite that the team wishes to attempt to observe any reduction in newborn deaths following introduction of the NTC, we will not be able to establish causality in this study.

4. Discussions among a few service providers indicated that some providers filled NTC cards after newborns were discharged. However, it was not possible to ascertain the accuracy of the recorded time in filled NTC cards.

5. A total of 18 filled NTC cards could not be linked to any of the live births in the register, hence, these were excluded from the initial study phase.

6. A few newborns had two NTCs filled. In this case, the study team selected the NTC with more observations conducted.

7. Despite that we interviewed a total of 14 service providers – only 12 were asked all the questions in the guide. Two service providers had only worked in the NICU and had minimal exposure to the NTC use, however, we interviewed these because they had worked in the NICU since it was established and were hence only asked questions related to the added value of NTC to the NICU.

6. ETHICAL CONSIDERATION

The quantitative part of this study utilized retrospective patient data which made making request of consent impractical. Also, since no identifying data was recorded on the Case Review Forms, we requested for a waiver of informed consent to access newborn data. On the other hand, written informed consent was obtained from all respondents for qualitative interviews. The processes for obtaining informed consent from qualitative study participants are described below.

6.1. Consent process

The consent process followed the international guidelines for obtaining informed consent where participants were read the informed consent script in Kiswahili and given a chance to ask questions. The field interviewers then ascertained verbally whether the participants had understood the information given, through probing about the key parts of the consent form, such as objectives of the research and voluntariness of participation in the study. If participants did not comprehend, the consent form was re-read, and participants were encouraged to ask questions. Participants willing to participate in the study acknowledged their consent by initialling, signing, and writing the date on the consent form. None of the potential participants was excluded from participation in this study due to not having provided informed consent.

6.2. Local research approvals and endorsement from local officials

Approval for this study was sought from the medical research coordinating committee (MRCC) of the national institute for medical research (NIMR). Prior data collection, introductions and permissions were sought from government representatives at the president's office – regional administration and local government (PO-RALG) and regional level.

7. STUDY FINDINGS

7.1. Respondents' perceptions on the usefulness of the NTC intervention.

All respondents for this study, including service providers and service managers, perceived the NTC as an extremely helpful tool in guiding services offered to the newborns. The most-commonly mentioned ways by which the NTC was deemed helpful to service providers were that; it assisted them towards knowing the correct actions to be taken for the newborns (mentioned by almost all service providers and service managers) and served as a reminder of the danger signs to look for when examining newborns (mentioned by 6 service providers).

> *Generally, I think that after starting to use this card, it reminds us of many things that we thought were not important to check for after a baby is born. After looking at the instructions on this card, we noticed that there are things that we must check on a baby just after delivery or those hours we stay to observe the child. (Service Provider)*

> *The colours tell us what to do according to the signs that we see on the newborn. There is green colour, and it tells us the newborn is okay. There is also red, and you will be directed on what to do. (Service manager)*

One service manager added that in the past service providers used to only focus on the mother and did not pay any attention to the newborns. However, after the introduction of the NTC babies are now also being examined.

> *Firstly, the babies are now examined. Examined meaning they are observed. At least, unlike in the past. I came here in 2012. During that time, when you got here in the morning you could even find six or more babies there in very bad condition, others were even dehydrated. (service manager)*

Both service providers and managers appreciated the fact that the NTC has provided them with an opportunity to conduct the initial triage of newborns and take appropriate action based on the newborn's condition, something that they were not doing before. Others noted that, the NTC has also served as a reminder for them to conduct subsequent observations for the newborns.

In addition to reminding them of what needs to be examined, some service providers appreciated the fact that the NTC also offered them a reference of what is normal when it comes to newborn vital signs. In so doing, it facilitated them to easily establish when something was not normal in a newborn. In relation to the latter finding, one service manager added that, the NTC card has also facilitated learning and internalization among service providers of what is normal and not normal in newborns.

Both service providers and managers felt that the NTC has greatly facilitated early identification of newborn problems that would otherwise be missed. The latter was reported having facilitated timely management of such conditions and thereby preventing complications and deaths of newborns. One service manager added that, by having different service providers examine the newborn at different intervals, it has facilitated discovering newborn problems before discharge, as compared to the past when babies could be discharged with problems.

> *We have been able to discover newborns that maybe at times they could be discharged home without knowing (if the baby had a problem) if we didn't use the checklist...There were babies who were discovered to have*

problems while they were still at the hospital. Which in real sense without using a checklist, these babies could be discharged without discovering their problems. (Service Manager)

But, after using the NTC card, and insisting it be used for every newborn, many newborns are being identified before reaching sudden death or critical stages. So, to me, I can say that the NTC is a screening tool that is helping to identify newborns with problems before they reach terminal or worse situations. (Service Provider)

Some service providers and service managers perceived the NTC card as having provided an opportunity for proper documentation of the baby's condition both at birth and during its stay in the ward. They added that, in the past one could examine the newborn but there was nowhere to document what was examined and what was found. However, the NTC card has provided this opportunity which was also deemed by some service managers as a great evidence that the baby was examined.

..This (NTC card) helps us, without the card, you might check for vitals but fail to get where to write them. You might observe the baby and conclude that she/he is doing well but where would you chart? Nowhere. (Service provider)

Before, the baby could be born, and you just see that he/she is okay, and you hand him/her over to the mother while he/she might not be able to breastfeed. The mother may sometimes not know when the baby is supposed to start sucking. So, in the end, you are told that the baby's condition changed suddenly, and he/she died. Those kinds of episodes occurred very frequently; that a baby suddenly died…when you question the care provider, he/she says that the baby was good after birth. Now, the 'good' is wide. You need to know that okay, good - did he/she suck? Did he/she cry well? What did he/she do? It was hard because we had no evidence. (Service manager)

Further, service providers added that the subsequent examinations of newborns have facilitated identification of the timing of the newborn problems. They added that, by looking at the filled NTC cards, they could easily tell when the baby's condition changed.

This card helps us to know how long after the baby born did she/he change? The nurses fill the card when the baby is born. So, through this card we will know how long did it take for the child's health to change? (Service Provider).

Establishment of the timing of the newborn problem was also noted to have created a means for accountability among service providers. One service provider and one service manager noted that information in the filled NTC cards has also facilitated clearing of misunderstanding and has prevented finger pointing by service providers when the baby's condition changed.

So, through this card, we will know, how long did it take for the child's health to change? This helps to tackle the challenge of people pointing fingers at each other regarding who caused a problem. Since the nurse will fill the card when the child was born, she will observe the baby again after 8 hours and then the nurse will know how long it took for the baby to change from the time, she/he was born. The card helps to stop pointing fingers at each other that a certain person caused the problem, whilst the problem might have started at that point or even before. This is what I think NTC helps with. (Service Provider)

Several service providers and service managers perceived the NTC as having led to a significant reduction of newborn deaths at Mbeya regional referral hospital. They added that, before the introduction of the NTC card, the hospital had many neonatal deaths, however, they said newborns deaths have significantly reduced following the introduction of the NTC intervention.

Yes, there have been many improvements because before, we had many child deaths because we didn't have a means that the child must be monitored after birth. Deaths have reduced after we started using this card. There was a time we finished a month without having any child death, which is when we realized that this card has helped us to move from one stage to another. (Service Provider).

In line with the qualitative findings, the data extracted from the HMIS showed a 65% reduction in neonatal deaths at MRRH from 48 in 2018 to 17 in 2020. The data also shows a rise in the number of deaths between 2016 to 2018 before declining in 2019 and 2020. It is, however, not possible to claim this reduction to the NTC intervention alone. The research team was further cautioned about the

quality of the shared data. The person that shared this data said not all deaths are captured by the system: he was most certain about having captured all deaths in 2020 but not in previous years.

Table 2. Number of child deaths at Mbeya Regional referral hospital (2015/2020)

Data / Period	2015	2016	2017	2018	2019	2020
Mbeya Regional Referral Hospital						
Deaths in health facilities - neonatal		1	14	48	5	17
Deaths in health facilities – 0-11 months		29	95	139	28	73
Deaths in health facilities – 0-4 years		35	100	143	30	73
Deaths in health facilities – maternal		2	10	15	4	14

All respondents felt that the NTC has been a great compliment to the neonatal care unit (NCU) that was already present at MRRH a year before the NTC was introduced. They added that, the NTC has facilitated timely referral of newborns to the NCU before the baby's condition is too serious, which has in turn facilitated saving many newborns' lives.

> *You can also see that this card is what has also led to the functionality of our NCU (Neonatal Care Unit). This is because if we didn't use the cards, we would not be isolating the babies who have problems, they wouldn't be recognized, and so there wouldn't be any patients over there. But, I think that all of this is the fruit of the card as well. (Service Manager).*

> *Previously, when we had no checklist, we used to get children with 2kgs and we remained with that child at the labour ward. The card now guides us, in case you think the baby does not fit there and is not supposed to stay in the labour ward or is supposed to be sent to NCU or transferred to other units (for management). Hence, it helps us. (Service Provider)*

Similarly, respondents also perceived the NTC as crucial tool at lower-level facilities without a NCU, as it would facilitate timely identification of danger signs and babies' referrals to higher-level facilities with a NCU.

7.2. Proportion of newborns assessed for danger signs using the NTC card.

Despite the perceived usefulness of the NTC card among respondents for this study, findings from the quantitative component of this study established only around half 520 (52.3%) of all babies born in the selected study periods having been assessed using the NTC (Figure1). The total number of live births during the selected study periods were 995: 336 in Apr 2018, 309 in Apr 2019 and 350 in Apr 2020. Findings noted an improvement in the proportion of newborns assessed using the NTC card from 23.3% (79/336) in Apr 2018 to 83.8% (259/309) in Apr 2019, followed a decline to 52.9% (185/350) in Apr 2020.

Figure 1. Number of newborns assessed using the NTC
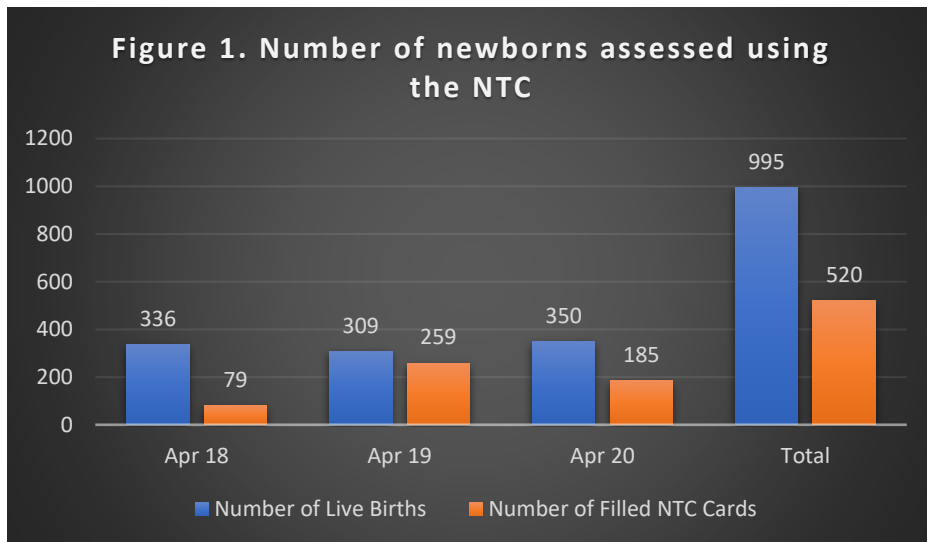
7.3. Number and types of assessments received by newborns.

A review of filled NTC cards established that the first assessment was always completed while a significant number of newborns did not receive the subsequent assessments. Figure 2 depicts the number/types of assessments received by newborns as established from a review of a sample of filled NTCs from the three selected study periods. As previously noted under the methods section above, the study team reviewed 392 (75.4%) of the total available 520 NTC cards; 79 (100%) from Apr 2018, 165 (63.7%) from Apr 2019 and 148 (80.0%) from Apr 2020. As can be seen from figure 2, all 392 (100%) NTC cards had the first assessment filled while 279 (83.8%) had the first and second assessment completed and only 138 (41.4%) had all the three assessments completed[3].

Figure 2. Number of assessments received by newborns with a completed NTCs

- Newborns who received 1st assessment
- Newborns who received 1st and 2nd assessment
- Newborns who received All three assessments
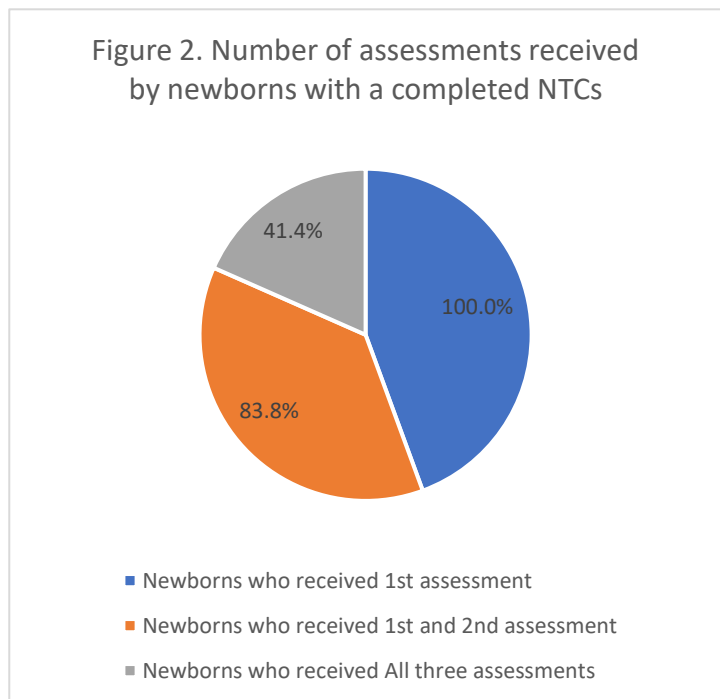
Overall, there was noted an improvement in the proportion of newborns that received both the first and second assessments, from 70.2% in 2019 to 95.5% in Apr 2020 (Table 3). On the other hand, findings established that the proportion of newborns that received all the three assessments had declined significantly from 78.3 % in 2018 to only 31.3% in 2019 and 32.3% in 2020. Findings also established that, 53 (15.9%)[3] newborns received only the first assessment; however, and on a positive note, there was a significant reduction in the proportion of newborns that received only the first assessment from 29.0% in 2019 to only 4.5% in 2020. It is also worth noting that, most of the differences were also statistically significant as noted by the p-value in green.

Table 3. Assessments received by newborns

Assessments received by newborns	Apr 2018	Apr 2019	Apr 2020	Total

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[3] The proportions given excludes newborns that were referred to NICU after each assessment as these did not required a subsequent assessment.

# Newborns who received 1st assessment *(n=392)*	79 (100%)	165 (100%)	148 (100%)	392 (100%)
# Newborns who received 1st and 2nd assessment *(n=333) * – P<.000*	60 (87.0%)	92 (70.2%)	127 (95.5%)	279 (83.8%)
# Newborns who received all 3 assessments *(n=331) ** – P<.000*	54 (78.3%)	41 (31.3%)	43 (32.3%)	138 (41.4%)
# Newborn who received ONLY the first assessment *(n=333) * – P<.000*	9 (13.0%)	38 (29.0%)	6 (4.5%)	53 (15.9%)
# Newborns who received ONLY first and second assessment *(n=333) * – P<.000*	6 (8.7%)	51 (38.9%)	84 (63.2%)	141 (42.3%)
# Newborn with observation chart completed, even a single item	0 (0.0%)	1 (0.6%)	0 (0.0%)	1 (0.3%)

This number excludes 59 newborns who were referred to NCU after the first assessment.

*** This number excludes 61 newborns who were referred to NCU after first (59 newborns) and second (2 newborns) assessments.*

As seen from Table 3, the observation chart was almost never used, with only one of the reviewed NTC cards (of a baby born in Apr 2019) having the observational chart filled. Discussions among service managers indicated that some service providers hesitated to tick the yellow part of the card because they did not want to stay with the baby longer to avoid conducting observations e.g. for up to 48 hours.

> *And even if someone discovers it, he/she would not want to work on that table, they will rather send him/her to NCU. Even though to me, I think it is better than for him/her (the nurse) to stay with him/her (the baby). But sometimes, it is full there (at the NCU). There are children who we can manage on our own here. They don't really need to go up there since they are not very severe. You would find it's just a little fever, 37 point something, such that they can stay here, and you may expose him/her or do something, and the baby will come back to normal. But because a person could be thinking about following up on that table, he/she would think that it is a disturbance and decides to transfer him/her (the baby). (Service Manager)*

7.4. Completeness and correctness of information under individual assessments.

No major information completeness issues were established under filled individual assessments. Table 4 depicts completeness status of selected variables under individual assessments. As can be seen from the table, over 90% of all the NTC cards reviewed had most of the key newborn information filled under the first assessment i.e., birth weight, date of birth, and PTMCT. Time for the first assessment was completed for 94% of all the reviewed NTCs while time for the second and third assessments were completed for 82.1% and 79.9% of all the reviewed NTCs respectively.

Table 4. Number of NTCs with selected variables completion status

Type of Variable	Apr 2018	Apr 2019	Apr 2020	Total
Number of NTC cards with newborns with birth weight filled *(n=392) – P=.001*	70 (88.6%)	162 (98.2%)	144 (97.3%)	376 (95.6%)
Number of NTC cards with newborns with date of birth filled *(n=392) – P=.014*	77 (97.5%)	146 (88.5%)	141 (95.3%)	364 (92.9%)
Number of NTC cards with PMTCT status filled *(n=392) – P=.338*	73 (92.4%)	158 (95.8%)	143 (96.6%)	374 (95.4%)
Number of NTC cards with time for the first observation written *(n=392) – P=.243*	71 (89.9%)	156 (94.5%)	141 (95.3%)	368 (93.9%)
Number of NTC cards with time for the second observation written *(n=279) – P<.000*	40 (66.7%)	66 (71.7%)	123 (96.9%)	229 (82.1%)
Number of NTC cards with time for the third observation written *(n=139) – P<.000*	51 (94.4%)	26 (61.9%)	34 (79.1%)	111 (79.9%)

On the other hand, 14 (3.6%) NTCs had at least one variable under the initial assessment not at all checked. When individual variables were examined closely, it was noted that the birth weight was not

at all checked in 8 NTCs, while 5 NTCs had none of the variables under the initial assessment namely, baby weight, maternal factors, respiration, skin circulation, movements, and other factors, checked. On the other hand, all NTCs reviewed had the Apgar score checked.

Figure 1. An NTC card with only the key baby's information completed.

This study was not designed to assess correctness of the information in the filled NTC cards; however, a few issues were noted that deserves attention, including checking of multiple options (where only one option was required) and ticking options for both danger and no danger signs under the same variable. For example, under the initial assessment (0-90 minutes), 8 (2.0%) of NTC cards had more than one option checked for the Apgar score. However, this was the only variable that was checked more than once. In addition to above, a few NTCs were checked for the presence of danger and no danger signs under the same variable. An example of this is provided under figure 2 below where the service provider ticked, under "respiration", breathing rate 'above 60/min', 'nasal flaring/chest indrawing' and also ticked 'normal breathing'. The latter rarely happened though - it wasn't at all noted under review of the first assessment – below figure is from the third assessment.

Figure 2. A filled NTC card with danger signs and no danger sign checked under "respiration" (column 3).

HOSPITAL NEWBORN TRIAGE CHECKLIST/ FACILITY: _____

3) Tathmini ya kati ya masaa 20 – 24 baada ya kujifungua / MUDA: 1Dau___   umefanywa na CO / AMO / MO

Uzito	Joto	Upumuaji	Ngozi na CRT	Kulisha	Kucheza	Kitovu	Mengineyo	Hatua za kuchuk...
Chini ya kg 2.5 ☐	Juu ya 38.0°C ☑ Chini ya 35.5°C ☐	Juu ya 60/dk ☑ Chini ya 30/dk ☐ Pua kutanuka/ Kifua kuingia ndani ☑	Bluu ☐ Nyeupe ☐ Rangi ya kijivu ☐ Njano ☐ CRT zaidi ya sek 3 ☐ Malenge lenge ☐	Hanyonyi au hanywinyi vizuri ☐ Kutapika kila baada ya mla ☐	Anachoza tu katea amechanganyikiwa ☐ kuchuaa ☐	Kutoka damu ☐ Chafundu au kutoa usaha ☐	Degedege ☐ Hapati choo na/au mkojo ☐ Ulimi kubonyea au uvimbe ☐ Hasira ☐ Macho kuvimba na/au kutoa usaha ☐	**HATARI** Mpeleke NCU au KMC Mara moja mule CO / AMO / MO
	37.6°C – 38.0°C ☐ 35.5°C – 36.4°C ☐							**HATARISHI** Uangalizi Uangalizi wa karibu tumia jedwali
Juu ya kg 2.5 ☑	36.5°C – 37.5°C ☑	30 – 60/dk ☐ Anapumua kawaida ☑	Rangi ya kawaida ☑ CRT sek 3 au chini ya sek 3 ☑	Vizuri ☑	Anacheza kawaida ☑	Hakimi damu ☑ Hakuna ambukizo ☑	Hakuna ☑	**HAKUNA HATARI** Unawwza kumruhusu mapema

Transfer to NICU

7.5. Time of and between assessments

As already mentioned above, service providers noted that many times they were not able to fill the NTCs at the allocated times due to high workload. The initial assessment was reported to always being filled in the labour ward, while the second and third assessments were most commonly completed after the newborn was transferred to the postnatal ward. In all cases, service providers noted that they prioritized providing care to mothers and newborns before filling the NTC cards.

> *Not at all times the cards are filled on time. For instance, 4 women came to give birth, one will make sure all women gave birth first and then she/he will start recording them in the card/system. (Service Provider)*

One service provider added that, only cards belonging to newborns with problems were filled immediately/timely.

The study team was not able to accurately establish the average time that elapsed from when the baby was born to when the baby received the first assessment due to the lack of 'time of delivery' variable on the NTC card. Also, secondary to the lack of 'dates of assessment' variable in subsequent assessments, it was difficult to calculate the time between subsequent assessments, in particular for newborns that stayed past midnight. However, findings from a limited number of cases (n=116), that the study team managed to compute this information, indicated that it took an average of 6.0 hours between the first and second assessment (ranging from 0 - 20 hours) and an average of 5 hours between the second and third assessment (ranging from 0-18 hours). The difference of '0' hours is a result of several filled NTC cards having similar time noted for different assessments. The latter was more commonly observed for the second and third assessment.

In line with above, findings from qualitative interviews suggested that some service providers filled information under several assessments on the NTCs at the same time. Respondents added that, at times NTCs were completed after newborns were already discharged.

> *But there are others who would come and find that it is not filled and will fill the whole thing to the end. But we would be thankful if he/she will fill it in that way and the baby is of good health as that won't bring a problem.*

If it brings a problem is when we come back and ask, 'how was this card this way and was the baby assessed?' I have met such kind of case. The baby was assessed, temperature was 36.0, everything was done. Within one hour, the baby's condition changed, and he/she died. So you ask yourself. And a baby doesn't die as fast as that. The condition cannot change within an hour and cause death. So you ask yourself if the assessment was actually done. So that is when you figure out that these cards are filled when the baby is already discharged. (Service Manager)

7.6. Barriers and Challenges facing effective implementation of the NTC intervention.

"We are facing hard times; I don't know if you can tell us. How to increase the uptake of the NTC cards. How to make sure the service providers embrace it and see it as one of the tools. I think this is a challenge and maybe when you write your last report, we can get lesson learnt from other people who have done this. This is a challenge to us, and we don't know how to deal with because I know that doing behavioral change has its challenges. If we manage to remove this negative thinking, of seeing that as extra work or someone filling the card after the child has been discharged".
{Service Manager}

7.6.1. Barriers for filling NTC cards.

The most-commonly reported barrier for filling NTC cards was the high workload among limited available number of staff leading to some newborns not having a filled NTC at all, service providers skipping subsequent assessments and, even more commonly, service providers not being able to adhere to the assessment schedule depicted on the NTC card. The high providers' workload resulting from a limited number of staff was noted by the majority (8/12) of service providers and all five service managers as the biggest barrier towards filling of NTC cards. They added that, most often you would find two service providers caring for around 25-30 women and required to offer various services including conducting examinations to pregnant mothers in labour, delivering newborns, escorting mothers needing caesarean section to the theatre, providing post-operative care, collecting medications etc. The latter posed a challenge towards filling NTCs for every newborn and/or completing all the three assessments as required.

If you have many patients, a person may fail to do everything that's why I talked about documentation. For example, we have 4 (delivery) beds; we may have 4 patients and antenatal have other patients waiting. A person may be working knowing that I have other patients. She/he may be busy and fail to fill the card. She/he may just fill the Apgar score and forget to fill the NTC card. (Service Provider)

But when it comes to reality, you find that the work that he/she has is a lot, and you wonder, can he/she neglect saving his/her PPH (post-partum haemorrhage) patient but instead fill in cards? When you go into reality, you see that he/she was right. (Service Manager)

Four service providers on the other hand felt that high workload did not affect filling of NTC cards. They felt that the NTC card did not take that much time and hence didn't add that much workload.

Other noted barriers for filling NTC cards were limited orientation of service providers on the importance of filling NTC card for every newborn and negligence / laziness among some service providers. Four service providers and one service manager perceived limited understanding on the importance of the NTC card among service providers as another contributing factor for limited use of NTC cards. In fact, lack of systematic orientation on the NTC card was noted by all service providers and all-but-one service managers as the potential cause of the limited use of the NTC cards. Respondents added that despite that a few service providers received training on the NTC, several other providers have been using the NTC without having received proper orientation because of internal rotation. Such providers were reported receiving simple directions on how to fill the card or just instructions that they should fill the NTC.

There have been events where people shift from one station to another. So, the challenge that someone faces is that he/she will be a stranger. He/she just reached there, doesn't understand. And other times you may shift and at the same time become the only one there. (Service Manager)

What contributes to not being able to use the card; I think the person does not know…; has not been trained on the proper use and is not aware of its importance. So, he/she knows it's a routine; a newborn delivered must have this form filled without taking into consideration the important points that whether the child has a problem or not. (Service Provider)

Three service providers and three service managers perceived negligence and laziness among service providers as reasons for not completing NTC cards.

Others when you ask, why didn't you fill the card? They will tell you simply, "I forgot". That's why I am saying service providers should know the importance (of filling the cards). (Service Provider)

There are those who don't fill them because they don't see the need to do so. There are others who, even if you teach them to what extent… Such kind of people exist, they exist even in families. Even if you explain to them the benefits of that thing. It's until he/she comes across such a scenario where maybe the baby suddenly changed, it's when he/she will now be touched. So, such kind of people are there, many of them. (Service Manager)

One service manager expressed a concern that many doctors did not fill NTC cards and rather perceived filling of NTCs as the nurses' task. The latter was reported causing many newborns delivered by doctors not having filled NTC cards.

Another challenge is on the doctors' side. That is, this card only concerns the nurse. The doctor is not concerned with it… Even if the doctor was present and had the time, but they don't care about this card. That is, they feel that it is not their responsibility. (Service Manager)

Also, worth noting, there was reported a notion that some service providers, particularly those who were more active in filling the NTC cards, had been secretly trained and are being paid to conduct assessments of newborns. Findings further suggest that, service providers with such a perception did not fill NTC cards because by doing so it felt to them as if they were doing someone else's job who is being paid to do it.

There are those who think if they fill the form, it is like they are doing someone's job because there is a certain person (care provider) who attended the training. Whilst this care provider did not go for training and just received on job training and learned the importance and rejoiced (about the card). (Service Provider)

But, if they feel that this will be done by a certain person, they'll leave without doing it, since when they see you are mostly doing it, they think that you are being motivated (paid). Others think like 'some people went for trainings! Some went for trainings and get paid!' (Service Provider)

None of the respondent reported lack of skills and availability of NTC cards as barriers for filling NTC cards. Findings from discussions among both service providers and service managers indicated that the NTC card is straight forward and self-explanatory. Three respondents added that, any service provider with appropriate pre-service training can easily fill the NTC without receiving any training. Further, all service providers and service managers reported NTC forms as being available at all times.

I don't think this (lack of skills) is a challenge. One does not need training to document things. The form is self-explanatory; it is just like a yes and no form. For example, it is like a person asking you, 'what is the situation of the umbilical cord of the baby?' She will ask you, 'is it bleeding or not bleeding?' What you need to do is, indicate if it is bleeding or not bleeding. You will be asked if the child is breastfeeding or not breastfeeding well. You will assess the baby and fill in the form accordingly. She/he is breastfeeding or not breastfeeding well. Therefore, these are just yes and no questions. I do not think it is a must that you get trained to answer a yes and no question. (Service Provider)

7.6.2. Challenges facing conducting individual assessments in NTC cards.

Despite that the NTC card was generally perceived as being straightforward and easy to use, this study established clarity issues around several criteria, including 'respiration', 'feeding',

"amniotic fluid', and the 'comments' section. Below are service providers own words explaining the challenges they are facing on completing these criteria.

> *For example, there is a section written flaring of the nose/chest indrawing, now here; you fail to understand if a child must go to NCU if the nose is expanding only and there is no chest indrawing, yet the two are put together. The nose is flaring without the chest indrawing, does this child go to NCU? Another person might see nasal flaring and the second thing isn't here (chest indrawing) and ask her/himself 'should I transfer the newborn?' Another challenge starts from here. (Service Provider)*

> *Down here on these times (Assessment times) where they ask whether she/he is breast-feeding well or not breastfeeding well. This is more concerning on the children whose mothers had C-section. We do give them glucose. Is it the way the baby feeds if you are using syringe, and when she vomits the glucose? Is it the same as vomiting after a meal? Or what do they mean? Or only after breast-feeding from her/his mother is when I should fill that way (vomiting after meals)? Or even the way I feed her/him (by giving glucose)? Because the baby will not stay with her/his mother for some time, and for this reason, I must feed the baby. (Service Provider)*

> *Sorry, here they say bad smell of the amniotic fluid, perhaps the mother may come with ruptured membrane with meconium that is thick, is this not included here or unless if a mother comes with foul smell? If I am transferring a baby with this meconium, in this smell section should I write normal, tick none, or I should add the thick meconium here? I also don't understand this part. (Service Provider)*

> *Under comments here, most of them fail to fill here that, 'what am I supposed to write, the comment of how I see the baby? or comments to where I am taking the newborn like what should be done?' I haven't understood what type of comments though I usually write comments about the baby for instance, 'the baby is good'. However, I write but I don't know what kind of comments should be written. (Service Provider)*

One respondent noted that, many service providers don't understand the meaning of CRT (this is listed as an abbreviation in the card).

> *What I see here; in the case of CRT (Capillary Refill Time). Most of us don't understand much about CRT (there is a need for more training) (Service Provider)*

Another service provider felt there was a need to train them on the use of the observation chart. She added that some service providers were not sure on how to use this chart.

One service manager noted that it was difficult to complete all the three assessments when they had to discharge both the mother and her baby prematurely (prior 24 hours) secondary to the limited space in the wards. She added that, at times there was high congestion in the wards and hence service providers were forced to discharge some of the newborns who had stayed at least 6-12 hours after delivery to make space for new mothers and newborns. In the latter case, the NTC card was only utilized for the first few hours leading to incomplete assessment.

7.6.3. Challenges related to handling of filled NTC cards.

Lack of specific procedures for storing/handling filled NTC cards were noted as among challenges facing implementation of the NTC intervention. For example, one service provider noted that one may fill the NTC and leave it in the labour ward as the baby gets transferred to the postnatal ward. Another service provider noted a challenge of handling NTC cards for babies born via caesarean section secondary the fact that the mothers and babies were kept in separate wards for several hours, in which case it was not possible to keep the NTC card in the mother's file which is a norm. The latter was reported causing many filled NTC of babies born via C/S to be misplaced.

> *For SVD (vaginal delivery), we have actually put a rule that when you get up with your baby, you should also have the (NTC) card. So, you may find that many of the cards are from SVD. But for the ones from caesarean section, I think we have truly misplaced many of their cards. (Service Manager)*

Further, despite that NTC cards that were kept in the mothers' files were supposed to be removed when the baby got discharged, it was noted that this wasn't done sometimes and led to misplacing the cards after the files were collected by the hospital management.

Another service manager noted a challenge related to misuse of new NTC cards. She said when some service providers made a minor mistake during filling of the card, they would tear the card, throw it away, and take a new one, instead of just crossing the mistake and re-using the same card, a challenge she perceived as leading to loss of many cards.

> *Instead of writing baby of XXX, he/she can make a mistake and write baby of YYY, while YYY already has a filled card. So, he/she throws it away and takes another one. But when you look at it, the only mistake there was the 'baby of'. I could have easily just crossed off the name and instead of writing XXX, I would write down the other name and it continues being used just well. (Service Manager)*

A significant number of service providers (7/12) and two service managers perceived NTC cards made of hard materials as easier to handle and store as compared to the soft copies. They added that the hard copies, that were initially provided, were not easily torn, were easier to store and lasted longer. On the contrary, the soft copies currently being used are easily torn, in particular when they get wet.

> *This one (the new papers), if anything gets on it it's easy to wear out. But the other one was a hard card and not easy to tear and it can last for long. (Service Provider)*

> *But maybe, if we could get the one that they first brought us. Because what has been brought now is like a copy, its thin like this one. They are also very fragile and tear. Because sometimes, as I had said, our care/handling is a problem. So you find that if you just drop spirit here, when you come back you will find it has already... But the other one was a little harder. We know that it is possible that that was more expensive, but it still helps us. (Service Manager)*

7.6.3. Danger signs / newborn assessment criteria perceived as important but currently missing in the NTC card.

Several respondents for this study recommended adding the danger signs / newborn assessment criteria below that they felt were important but are currently missing in the NTC card :-

a. Maternal factors: postpartum haemorrhage & eclampsia. They added that, since mothers with such conditions are not to breastfeed the newborns, their babies are already being transferred to NCU.

b. Newborn conditions: they also considered babies with the following conditions as being at risk – babies born with cord prolapse and meconium-stained babies (whole body). One service manager recommended adding criteria for evaluating the newborn's genitalia secondary to having missed an abnormality despite a filled NTC card.

> *Yes. The genitalia. Because we had gotten two consecutive cases, that were our deliveries, where the mother left and stayed home for almost a month. That is, by the time they realize, the child does not pass stool. When they checked, the anus is closed. So they came back. And XXX here is the one who discovered it. This was our delivery. So, I think that would be great... How can we say it? That is to know fully well that, is the vaginal orifice present? And is the anus present? And is the urethra okay? Because someone can leave with a blocked urethra. So, if someone doesn't examine... But the card helps us a lot, even though we check for that too. But if that feature was also in the card, I think that would also help us to be keener. (Service Manager)*

7.7. Approaches currently being used to address challenges facing implementation of the NTC intervention.

To ensure that each newborn has a filled NTC card and filled information in individual assessments are correct, handover procedures were introduced during newborn transfer and shift changes: respondents noted that, when newborns were shifted from the labour ward to the postnatal ward, they wouldn't be received without a filled NTC card. Additionally, the receiving provider at the postnatal ward conducted an assessment of the newborn to double-check what was

written in the NTC and that the postnatal ward was the correct place to bring the newborn. This approach was reported working very well not only in facilitating more newborns to receive assessments but also in ensuring that the filled information in the NTC is correct and the baby is transferred to the appropriate ward.

> *We check the temperature again for the second time. We sometimes even write down here that we received the baby at this certain time with a temperature of this and this. So, if he/she has a high temperature, we tell the nurse "We can't receive this baby, please send him/her to NCU." And this happens a lot. After having observed that a short while after they (newborns) come to us (postnatal ward), the baby gets high temperature, we wondered 'Does this mean that the high temperature started suddenly? (Service Provider)*

In addition to above, it was reported that the management initiated a register that was to be filled when a baby was brought in from the labour ward where service providers noted whether they also received a filled NTC card or not.

The hospital management reported having attempted to change the three normal shifts for nurses to two shifts, added that this approach worked very well in addressing shortage of staff per shift, however, it was stopped due to lack of resources to compensate service providers for the overtime. One service manager reported this past practice and added that the results were very positive and that there was even noted a decline in perinatal deaths during that particular period, but the two shifts could not be maintained because the hospital could not manage to sustain compensation of staff for their overtime.

Another service manager noted the switch of many service data into electronic format as having facilitated a significant reduction in the number of filled paper forms which has in turn made it easier for them to locate the filled NTC forms in patients' files.

7.8. Facilitators and motivators for proper filling of NTC cards.

The most-commonly reported facilitator/motivator for service providers to fill NTCs was frequent emphasis from service managers/supervisors in the form of reminders on the importance of filling the NTC card for every newborn. Several service providers and service managers acknowledged that when supervisors followed up and reminded service providers to fill the NTC for every newborn, they often did so. On the other hand, when there was no emphasis, some service providers relaxed and stopped doing so.

> *It reaches a point that leaders stop making follow-ups and this can make also health service providers relax. But if they start emphasizing that they want all newborn delivered should have a NTC card to discover any problem immediately she/he could be transferred to NCU. They will fill the cards. If they don't put emphasis, service providers also relax. (Service Manager)*

In particular, several service providers noted that frequent supportive supervision and mentorship to service providers in NTC use was very helpful in facilitating appropriate use of the cards.

> *Like Dr x tries her level best, because most of the time she stays in NCU. Therefore, when you take a baby there and she looks at the card; if you have filled it differently, she would tell (guide/direct) you. She even used to come here (labour/postnatal ward), she will ask and check the form like 'how you are doing? Or do you have any challenges?' So, she is trying her level best (to supervise and mentor). (Service Provider)*

On another note, three service providers felt that there currently isn't sufficient supervision and emphasis among service providers to fill the NTC cards, which they felt may be causing some of them not to see the importance doing so.

> *No, truly we don't get supervision, maybe other service providers have been asked before or taught more about this card. This is why I am saying that some people might think the card is not important because people just fill in the information as a routine, but I have never seen anyone making follow-ups to know how the NTC cards should be and what the card is doing. (Service Provider)*

One service provider felt that it was those who attended the training that were motivated to fill the NTC cards while another service provider noted that it was easier for service providers to fill the NTC on days when there was less workload.

Several respondents (including two service providers and two service managers) said use of information in the filled NTC cards as a reference when something wrong happened to the newborns was a motivating factor among service providers to fill the NTC cards. They added that some service providers filled the NTC cards because they were worried that if something wrong happened to the newborn, and service managers inquired what was noted in the NTC card, it could bring them trouble.

> *When you ask him/her "why are you doing this (filling the NTC)?", he/she replies, "I personally think it will help me later, although at the moment I have not seen any benefit of this". (Service Manager)*

> *Now, this thing of saying that the baby reached NCU and then died and maybe she stayed with her mother for maybe 8 hours or 10 hours onwards, with that, we will start asking from the beginning; did you monitor the baby? Perhaps someone was working out of norm, filling it casually without examining. (Service Provider)*

Further, the design of the NTC card was perceived by all service providers and service managers as being very user-friendly. Respondents added that, the items were easily understandable, its filling did not take time as all was required was put a tick under relevant boxes, and the three different colours made it easier for them to make conclusion regarding the baby's condition. Several respondents also appreciated the fact that the NTC card is in Swahili, the language that they can easily understand. Many perceived the colour codes as being extremely helpful to them. They even gave an example of a period when the cards were printed in black and white and said it was difficult for them to easily make a conclusion on the baby's condition as compared to when it is colour-coded.

> *It is easy because there are different colours used to indicate; for instance, red means high danger, yellow means danger but needs closer monitoring, green means the child doesn't have any problem and there isn't any danger sign. Therefore, by using different colours it has made it easy to understand the card than if it was just blank. Whenever you've seen a single red tick- (you know) there is a problem there. (Service Provider)*

> *Yes, black and white. It brought us challenges as people had memorized the colours, if you peruse there, you will find that during that period the cards posed challenges. Because you find someone is starting to wonder "Now what will it be here?", and another person is thinking for a bit and the time goes by, so you just dump it there. Like that... But if it was visible that the table is yellow, you know absolutely that okay yellow zone is straight forward for close observation and if possible, to initiate treatment or to transfer. But now with that one, from the beginning to the bottom, there is just one colour, so that has been a challenge for us as well. (Service Manager)*

Regarding design, several service providers and managers also recommended putting the NTC card in electronic system as way of tackling the challenge of mishandling of both plain and filled NTC cards.

7.9. Other interventions for newborns at Mbeya regional referral hospital.

Apart from the NCU and NTC, the other intervention that was noted as being implemented at MRRH was the help babies breath (HBB) intervention that was implemented by Jhpiego around 2015. As part of HBB intervention, it was noted that all service providers received training and the hospital was given a supply of equipment for helping babies to breath including, Ambu bags, nasogastric tubes, penguin suckers etc. One respondent added that UNICEF also provided more of similar equipment after a while (but she couldn't remember the exact timing).

Another intervention that another service manager could recall was that under KFW. The intervention was reported to offer health insurance coverage for all pregnant mothers and their newborns which facilitated availability of supplies at the hospital and both the mother and newborn to access all supplies for free.

> *By that time, they gave health insurance (NHIF) to all pregnant mothers so long as you have been confirmed pregnant and they received all benefits just like other normal NHIF members. The insurance covered throughout the pregnancy, during delivery and 6 months after delivery. The child was also covered under this insurance for this period of time. This was the time that we enjoyed because we were not struggling with supplies. For example, we are now struggling*

a lot with minor supplies like gauze, gloves. In the past, when a pregnant mother came, we were sure that she would leave something that can circulate also be used by other women. So, we did not struggle with minor supplies. I am not sure if this will ever repeat again. It was one of the best times that I served while I am here. Supplies where not an issue to us. (Service Manager)

8.   CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

Generally, this study established a consensus among all service providers and service managers that, when appropriately and effectively used, the NTC is a very helpful tool in guiding services offered to the newborns. On the other hand, the use of NTC to assess newborns for danger signs at MRRH is still suboptimal with only around half of all newborns currently being assessed using the NTC. There was noted a sharp decline in the proportion of newborns assessed using NTC, from 83.8% in 2019 to 52.9% in 2020. Similarly, a review of a sample of filled NTCs also showed a decline in the proportion of newborns that received all the three assessments from 78.3 % in 2018 to only 31.3% in 2019 and 32.3% in 2020.

When service providers conducted the assessments, information incompleteness was rarely noted. Some filled NTCs had minor errors, including having more than one option checked in scenarios where only one option was supposed to be checked and some service providers checking for both the presence of danger and no danger signs under the same variable. The latter errors were also noted rarely. The finding that the observation chart was almost never used calls for attention around this section of the NTC.

The most-commonly reported barrier for filling NTC cards was the high workload among the limited available number of staff leading to some newborns not having a filled NTC card at all, skipping of subsequent assessments, and more commonly, service providers not being able to adhere to the assessment schedule depicted on the NTC card. Other reported barriers for filling NTC cards were limited orientation of service providers on the importance of filling NTC card for every newborn and ignorance among some service providers.

On a positive note, the NTC card was generally perceived as being easy to use and its filling straightforward. Additionally, its design was perceived as being user-friendly, including that items were easily understandable, filling of the card did not take time, and all respondents perceived the three different colour codes as making it easier for them to make conclusion regarding the baby's condition.

Frequent reminders and emphasis from service managers was deemed crucial in facilitating service providers filling of NTC cards for every newborn. Additionally, findings suggest that use of the information in the filled in NTCs as part of auditing process whenever something wrong happens to a newborn further facilitates effective filling of NTCs.

This study noted a few clarity issues around certain criteria, including 'respiration', 'feeding', "amniotic fluid', Capillary Refill Time (CRT), and 'comments' section. Additionally, two main issues were reported regarding handling of the filled NTC cards, including lack of specific procedures for storing/handling filled NTC cards and service providers tearing and throwing away partially filled NTC cards with minor mistakes that could be easily cancelled, and enable the card to be used again.

8.2. Recommendations

8.2.1. Recommendations on the design of the NTC card

8. Based on findings from this study, the study team recommends to use key moments in the newborn's continuum of care as timing for conducting the various assessments in the NTC instead of hours which were hardly adhered by service providers.

   - We recommend, the first observation to be done within 60-90min as it is currently being done.
   - We recommend the second observation to be done as soon as the baby is received in the postnatal or NCU ward by the service provider receiving the newborn. The latter may facilitate confirming that the newborn was transferred to the correct place and prevent admitting newborns with danger signs in the postnatal wards, which could delay referral to NCU.
   - Final observation should be done just before the newborn is discharged – this will ensure that no newborn with a danger sign is sent home.
   - An additional observation may also be done when providers are exchanging shift – to help the provider coming in the shift ascertain the condition of the newborns in her shift.

   Conducting assessments at the three recommended moments does not require the service provider to remember time for subsequent assessments. Hence, may facilitate effective implementation of the NTC intervention by tackling one of the key challenges noted by this study where many service providers said it was *difficult for them to remember the time* for conducting subsequent assessments secondary to the high workload. Further, since service providers would need to conduct the assessment at the time of receiving the newborn it may facilitate them to inquire for a filled NTC at the time of newborn transfer which may further facilitate all newborns having a filled NTC.

   The study team also feel that, conducting assessments at the three recommended time points may facilitate all newborns to receive all the 3 assessments despite the length of stay in the facility.

9. Since, the NTC card was deemed to aid accountability when something wrong happens to the baby, adding a space for a signature of the service provider under each assessment may further aid accountability.

10. The study team also recommend adding the variables below to aid effective monitoring and evaluation of the NTC intervention in future:
    b. "*Type of delivery*" – it was mentioned in this study that most of the newborns without a filled NTC were those born via C/S – hence, this information could help ascertain whether this was true. Also, babies born via C/S may have different health risks, compared to those born vaginally.
    a. "*Time of birth*": - this variable would facilitate ascertaining the time lag between childbirth and the first assessment.
    b. "*Time of discharge*" – this variable would facilitate knowing the length of time the newborn stayed prior being discharged.
    c. "*Date under each individual assessment*" – the study team faced a challenge in calculating the number of hours that elapsed between assessment because the dates for subsequent assessments were not noted. It would be great to add date of the assessments as there could be a change of date if the baby stayed over mid-night.

11. If feasible all abbreviations in the NTC card, e.g., CRT should be expanded to facilitate easy understanding in case of NTC use by providers not already oriented.

12. The programme may need to consider adding some of the danger signs / newborn assessment criteria suggested by respondents for this study, which are currently missing.

13. Service providers recommended NTC cards to be printed on hard papers and not soft papers, and always to be colour coded.

14. Lastly, service providers recommended putting the NTC card in electronic system as way of tackling the challenge of mishandling of both plain and filled NTC cards.

8.2.2. Recommendations to facilitate effective implementation of the NTC intervention.

7. Findings suggests that the limited use of NTC cards established in this study is primarily due to lack of orientation among service providers on the importance (benefits / impact) of NTC rather than lack of skills on how to fill NTC cards. All service providers and service managers felt that there was a need for frequent training/orientation of service providers on the NTC card along with sensitization on the importance of filling NTC cards for every newborn. It was particularly deemed that more sensitization is needed among medical doctors who perceived filling of NTC cards as a nurses' role.
8. Findings further established that there are a significant number of providers that have not received any orientation on the use of NTC card at MRRH while at the same time it was reported that there are service providers trained to offer mentorship to other facilities. These may be utilized to offer orientation at MRRH as well.
9. Service providers orientation on the NTC intervention may also incorporate effective measures for handling both plain and filled NTC cards. If such measures are not yet in place, they should be established in collaboration with service providers themselves.
10. The programme may consider a refresher training on the specific criteria mentioned in this study as having clarity issues.
11. We recommend that there should be regular performance reviews on the use of NTC cards. The review may be as simple as total NTC cards filled versus total live births. One service provider recommended incorporating updates on NTC cards in routine morning meetings where service providers would report on the number of live births, how many newborns had danger signs/were referred to NCU and how many were in good health (information that would come from findings from the NTC assessments for each newborn).

12. Lastly, if enough care is not taken, the reported practices where a busy nurse observes several babies, continues doing other tasks, and later sits down and fills several NTC cards may potentially lead to exchanging baby's findings.

8.2.3. Recommendations for further studies

2. Findings from this study suggests that the NTC is a highly potential intervention for reducing neonatal deaths, which is still a major challenge in Tanzania as well as in many other African countries. A well-designed study involving multiple health care delivery levels (e.g., including health centre and dispensary level), may facilitate generation of strong evidence on the impact of this intervention. Specifically, it may be of interest to learn how the NTC intervention works at lower-level facilities without a neonatal care unit (NCU).

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10. ANNEXES

10.1. Newborn Triage Checklist

Newborn Triage Checklist

Kituo:

Jina:	Uzito wa kuzaliwa:	ID-No.:
Tarehe ya kuzaliwa:	PMTCT: 1□ 2□	Maoni:

Tathmini baada ya dakika 60 hadi 90 baada ya kuzaliwa   Muda:

	Uzito wa kuzaliwa	Apgar score dk 5	Joto la mtoto	Hali ya Mama	Upumuaji	Ngozi na CRT	Kucheza	Mengineyo	Hatua za kuchukua
NYEKUNDU	□ Chini ya kg 1.8	□ Chini ya 7	□ Juu ya 37.5 °C □ Chini ya 36.0 °C	□ Chupa kupasuka (PROM) juu ya 18 h □ Harufu mbaya ya maji ya chupa □ Joto la mama juu ya 38.0°C	□ Juu ya 60 /dk □ Chini ya 30 /dk □ Pua kutanuka /kifua kuingia ndani/grunting	□ Mdomo wa blue (central cyanosis) □ Nyeupe (pallor) □ CRT juu ya sek. 3	□ Hachezi □ Anacheza tu kama amechangamshwa	□ Congenital malformation □ Degedege	HATARI **Mlaze NCU au rufaa kwenda kituo chenye NCU** Mwanzishie IV/IM antibiotics bila kuchelewa
NJANO	□ kg 1.8 – 2.4 □ Juu ya kg 4.0	□ 7 – 8	□ 36.0 °C – 36.4 °C						HATARISHI **Tumia jedwali la uchunguzi** **Uzito kg 1.8 – 2.4:** Mlaze NCU au rufaa kwenda kituo chenye KMC **Uzito juu ya kg 4.0:** Dhibiti kiasi cha sukari kila baada ya masaa mawili hadi mama atakuwa na maziwa ya kutosha
KIJANI	□ kg 2.5 – 4.0	□ Juu ya 8	□ 36.5 °C – 37.5 °C	□ Hakuna	□ 30 – 60 /dk □ Anapumua kawaida	□ Rangi ya kawaida □ CRT sek. 3 au chini ya sek. 3	□ Anacheza kawaida	□ Hakuna	HAKUNA HATARI Endelea na uchunguzi baada ya masaa 4 hadi 8 baada ya kuzaliwa

Tathmini ya pili (masaa 4 – 8 baada ya kuzaliwa)   Muda:

	Kitovu	Kulisha	Joto la mtoto	Hali ya Mama	Upumuaji	Ngozi na CRT	Kucheza	Mengineyo	Hatua za kuchukua
NYEKUNDU	□ Kutoka damu	□ Hanyonyi au hanyonyi vizuri □ Kutapika kila baada ya mlo	□ Juu ya 37.5 °C □ Chini ya 36.0 °C	□ Joto la mama juu ya 38.0 °C	□ Juu ya 60 /dk □ Chini ya 30 /dk □ Pua kutanuka/kifua kuingia ndani/grunting	□ Bluu (cyanosis) □ Nyeupe (pallor) au rangi ya kijivu □ Njano □ CRT juu ya sek. 3	□ Hachezi □ Anacheza tu kama amechangamshwa	□ Degedege □ Utosi kubonyea au uvimbe □ Hasira (irritability)	HATARI **Mlaze NCU au rufaa kwenda kituo chenye NCU** Mwanzishie IV/IM antibiotics bila kuchelewa
NJANO		□ Breastfeeding problems	□ 36.0 °C – 36.4 °C						HATARISHI **Tumia jedwali la uchunguzi** Zahanati: Rufaa kwenda kituo chenye NCU Ngazi ya juu zaidi: Uangalizi wa karibu, boresha huduma ya joto/boresha kumlisha
KIJANI	□ Hakitoi damu	□ Vizuri	□ 36.5 °C – 37.5 °C	□ Hakuna	□ 30 – 60 /dk □ Anapumua kawaida	□ Rangi ya kawaida □ CRT sek. 3 au chini ya sek. 3	□ Anacheza kawaida	□ Hakuna	HAKUNA HATARI Endelea na uchunguzi angalau hadi masaa 24 baada ya kuzaliwa

Newborn Triage Checklist

	Uzito wa muda huu	Kulisha	Joto la mtoto	Kitovu	Upumuaji	Ngozi na CRT	Kucheza	Mengineyo	Hatua za kuchukua
NYEKUNDU	☐ Chini ya kg 1.8	☐ Hanyonyi au hanyonyi vizuri ☐ Kutapika kila baada ya mlo	☐ Juu ya 37.5 °C ☐ Chini ya 36.0 °C	☐ Kutoka damu ☐ Chekundu au kutoa usaha	☐ Juu ya 60 /dk ☐ Chini ya 30 /dk ☐ Pua kutanuka/kifua kuingia ndani/grunting	☐ Bluu (cyanosis) ☐ Nyeupe (pallor) au rangi ya kijivu ☐ Njano ☐ CRT juu ya sek. 3 ☐ Malengelenge	☐ Hachezi ☐ Anacheza tu kama amechangamshwa	☐ Degedege ☐ Hapati choo na/au mkojo ☐ Utosi kubonyea au uvimbe ☐ Hasira	**HATARI** Mlaze NCU au rufaa kwenda kituo chenye NCU Zahanati: Mrufaa Kituo cha afya: Mlaze au mrufaa Mwanzishie IV/IM antibiotics bila kuchelewa
NJANO	☐ kg 1.8 – 2.4	☐ Breastfeeding problems	☐ 36.0 °C – 36.4 °C					☐ Macho kuvimba na/au kutoa usaha	**HATARISHI** Tumia jedwali la uchunguzi Uzito kg 1.8 – 2.4: Mlaze NCU au rufaa kwenda kituo chenye KMC
KIJANI	☐ Juu ya kg 2.5	☐ Vizuri	☐ 36.5 °C – 37.5 °C	☐ Hakitoi damu ☐ Hakuna ambukizo	☐ 30 – 60 /dk ☐ Anapumua kawaida	☐ Rangi ya kawaida ☐ CRT sek. 3 au chini ya sek. 3	☐ Anacheza kawaida	☐ Hakuna	**HAKUNA HATARI** Mwandae kuruhusiwa na mshauri mama kuhusu dalili za hatari

Tathmini ya tatu (masaa 20 – 24 baada ya kuzaliwa)   Muda: _____

Jedwali la uchunguzi kwa watoto wachanga walio katika HATARISHI – mchunguze kila baada ya masaa sita kwa muda wa masaa 48

Muda kutoka uchunguzi wa awali	Muda wa uchunguzi	Joto (°C)	Kiasi cha upumuaji (/dk)	Kulisha 1) Vizuri 2) Si vizuri	Kucheza 1) Kawaida 2) Hachezi vizuri	Uzito (Pima kila baada ya masaa 24)	Rufaa kwenda kituo chenye NCU kama:
Saa 0							**Joto:** Chini ya 36 °C au juu ya 37.5 °C ✷
Masaa 6							
Masaa 12							**Kiasi cha upumuaji:** Chini ya 30 /dk au juu ya 60 /dk ✷
Masaa 18							
Masaa 24							**Kulisha:** Si vizuri (2) ✷
Masaa 30							**Kucheza:** Hachezi vizuri (2) ✷
Masaa 36							
Masaa 42							**Uzito:** Kupungua zaidi ya 10 % ya uzito wa kuzaliwa
Masaa 48							✷= Mwanzishie IV/IM antibiotics kabla ya rufaa
Kama uzito juu ya kg 4.0: pima sukari kila baada ya masaa mawili, endelea kutumia kadi ya NTC kama kawaida (kutumia 'jedwali la uchunguzi' haihitajiki)							
Taarifa za nyongeza:							

10.2. List of Persons Interviewed

Appendix 1. List of respondents for in-depth interviews

#.	Position / Cadre	Department	Interview Category	Duration Working with Newborns at MRRH
1	Assist. Reproductive and Child Health Coordinator	MoHCDGEC	Service manager	More than 6 yrs
2	Head of OBS & Gyn Department	Obstetric & Gynaecology	Service manager	More than 6 yrs
3	Block Manager	Maternity - Labour, theatre and postnatal	Service manager	More than 6 yrs
4	Block Manager	Paediatric – General & NCU	Service manager	More than 6 yrs
5	Former RRCHCO	MoHCDGEC	Service manager	11 yrs
6	Nurse	Postnatal	Service provider	Not inquired
7	Nurse	Postnatal	Service provider	Not inquired
8	Nurse	Postnatal In-charge	Service provider	8 months
9	Nurse	Postnatal	Service provider	4 yrs
10	Nurse	Postnatal	Service provider	15 yrs
11	Nurse	Labour ward	Service provider	7 yrs
12	Nurse	Incharge_Labour ward	Service provider	5 yrs
13	Nurse	Incharge _Labour Theatre	Service provider	10 yrs
14	Doctor	Labour and Postnatal	Service provider	3 yrs
15	Nurse	Labour Theatre	Service provider	3 yrs
16	Nurse	NCU	Service provider	21 yrs
17	Nurse	NCU	Service provider	9 yrs
18	Nurse	NCU	Service provider	8 yrs
19	Nurse	NCU	Service Provider	7 yrs

10.3.1. Case review form

Case Review Form

Assessment of the Neonatal Triage Checklist (NTC)

Data Collector's Name: _____

Date of review (dd/mm/yyyy): _____ / _____ / _____

Data Collection Instructions: Using the facility's Labor and Delivery (L&D) register, identify all babies who were delivered in this facility during the period of interest (April 2018, April 2019, and Apr 2020). Working with the Matron and other facility staff, collect all records for each baby who was delivered during each of the three months above. Records for each baby **may** also include the completed partograph, completed NTC card, baby's information recorded in the L&D register, nurse's notes, case records, and any another other baby records in use at the facility.

Refer to these materials and complete one Case Review Form (CRF) for each baby delivered during the 3-month period above. For each item on the CRF select '**Yes'** if the item was checked, and '**No'** if the item was not checked. Use the '**Comments'** section to write any other information filled on the card (if any) under each item.

Case ID Instructions: Complete the Unique Case Identifier (UCI) by entering your Data Collector Number (assigned to you at training), and the case review number. The case review number is a sequential number starting with 01 for the first case you reviewed in this health facility (the second case that you review will be 02, a third 03 etc.). Enter the UCI for at the top of each page of this Case Review Form.

SECTION I: Basic Information				
#	Item	Responses		Comments
101.	Facility:			
102.	ID-No:			
103.	Birth Weight:			
104.	Date of Birth:			
105.	PMTCT: (*Circle the checked response in the NTC*)	1	2	
106.	Comments:			

SECTION I: Basic Information		
#	**Item**	**Responses**	**Comments**

Was the 1st evaluation done? (If yes, complete items checked)

SECTION II: 1st Evaluation after the Golden Hour (60-90 min after birth)			
*Instructions: For each item tick '**Yes**' if the item was checked, and '**No**' if the item was not checked.*			
#.	**Item**	**Responses**		**Comments**
201.	Time	Hr: _____ Min: _____		
202.	Birth weight	**Yes**	**No**	
	a) < 1.8 kg			
	b) 1.8 – 2.4 kg			
	c) 2.5 – 4.0 kg			
	d) > 4.0 kg			
203.	APGAR at 5 min	**Yes**	**No**	
	a) < 7			
	b) 7 – 8			
	c) > 8			
204.	Temperature	**Yes**	**No**	
	a) > 37.5 °C			
	b) < 36.0 °C			
	c) 36.0 – 36.4°C			
	d) 36.5 – 37.5 °C			
205.	Maternal factors	**Yes**	**No**	
	a) PROM > 18 h			
	b) Foul smelling amniotic fluid			
	c) Maternal pyrexia (>38.0 °C)			
	d) None			
206.	Respiration	**Yes**	**No**	
	a) >60/min			
	b) <30/min			
	c) Difficulty in breathing (Grunting, nasal flaring, chest indrawing)			
	d) 30-60/min			
	e) Normal breathing			
207.	Skin circulation	**Yes**	**No**	
	a) Central cyanosis			
	b) Pallor			
	c) Capillary refill >3sec			
	d) Normal colour			
	e) Capillary refill ≤3sec			
208.	Movements	**Yes**	**No**	
	a) No movements at all			
	b) Movements only when stimulated			
	c) Normal movements			
209.	Others	**Yes**	**No**	
	a) Congenital malformation			
	b) Convulsions			
	c) None			

210.	List actual actions taken for the baby (this should be completed only if any of the following information is available: refer nurse's notes, case records, and any another other baby records in use at the facility)
	a)
	b)
	c)
	d)
	e)

Was the 2nd evaluation done? (If yes, complete items checked)

SECTION III: 2nd Evaluation (4-8 hrs after birth)				
Instructions: *For each item tick '**Yes**' if the item was checked, and '**No**' if the item was not checked.*				
#.	**Item**	**Responses**		**Comments**
301.	Time	Hr: _____ Min: _____		
302.	Umbilicus	**Yes**	**No**	
	a) Bleeding			
	b) No bleeding			
303.	Feeding	**Yes**	**No**	
	a) Not sucking or not sucking well			
	b) Vomiting after each feed			
	c) Breastfeeding problems			
	d) Normal			
304.	Temperature	**Yes**	**No**	
	a) > 37.5 °C			
	b) < 36.0 °C			
	c) 36.0 – 36.4°C			
	d) 36.5 – 37.5 °C			
305.	Maternal factors	**Yes**	**No**	
	a) Maternal pyrexia (>38.0 °C)			
	b) None			
306.	Respiration	**Yes**	**No**	
	a) >60/min			
	b) <30/min			
	c) Difficulty in breathing (Grunting, nasal flaring, chest indrawing)			
	d) 30-60/min			
	e) Normal breathing			
307.	Skin & circulation	**Yes**	**No**	
	a) Central cyanosis			
	b) Pallor or grey colour			
	c) Jaundice			
	d) Capillary refill >3sec			

#	Item	Yes	No	Comments
	e) Normal colour			
	f) Capillary refill ≤3sec			
308.	Movements	**Yes**	**No**	
	a) No movements at all			
	b) Movements only when stimulated			
	c) Normal movements			
309.	Others	**Yes**	**No**	
	a) Convulsions			
	b) Fontanelle sunken or bulging			
	c) Irritable			
	d) None			
310.	Was any of the actions to take below checked?	**Yes**	**No**	
	a) HIGH RISK: Admit at/refer to facility with NCU			
	b) HIGH RISK: Immediate administration of IM/IV antibiotics			
	c) AT RISK: Use observation chart			
	d) AT RISK: - Dispensary: refer to facility with NCU - Higher level: Close observation, improve thermal care			
	e) NO RISK: Continue observation until at least 24 hrs			
311.	List actual actions taken for the baby (refer nurse's notes, case records, and any another other baby records in use at the facility			
	a)			
	b)			
	c)			
	d)			
	e)			

Was the 3rd evaluation done? (If yes, complete items checked)

SECTION IV: 3rd Evaluation (20-24 hrs after birth)				
Instructions: *For each item tick '**Yes'** if the item was checked, and '**No'** if the item was not checked.*				
#.	**Item**	**Responses**		**Comments**
401.	Time	Hr: _____ Min: _____		
402.	Current weight	**Yes**	**No**	
	a) < 1.8 kg			
	b) 1.8 – 2.4 kg			
	c) ≥ 2.5 kg			
403.	Feeding	**Yes**	**No**	
	a) Not sucking or not sucking well			
	b) Vomiting after each feed			
	c) Breastfeeding problems			

	d) Normal			
404.	Temperature	**Yes**	**No**	
	a) > 37.5 °C			
	b) < 36.0 °C			
	c) 36.0 – 36.4°C			
	d) 36.5 – 37.5 °C			
405.	Umbilicus	**Yes**	**No**	
	a) Bleeding			
	b) Red or draining pus			
	c) No bleeding			
	d) No sign of infection			
406.	Respiration	**Yes**	**No**	
	a) >60/min			
	b) <30/min			
	c) Difficulty in breathing (Grunting, nasal flaring, chest indrawing)			
	d) 30-60/min			
	e) Normal breathing			
407.	Skin & circulation	**Yes**	**No**	
	a) Cyanosis			
	b) Pallor or grey colour			
	c) Jaundice			
	d) CRT (capillary refill time) >3sec			
	e) Pustules			
	f) Normal colour			
	g) Capillary refill ≤3sec			
408.	Movements	**Yes**	**No**	
	a) No movements at all			
	b) Movements only when stimulated			
	c) Normal movements			
409.	Others	**Yes**	**No**	
	a) Convulsions			
	b) Failure to pass meconium and/or urine			
	c) Fontanelle sunken or bulging			
	d) Irritable			
	e) Eyes swollen and/or pus draining			
	f) None			
410.	Was any of the actions to take below checked?	**Yes**	**No**	
	a) HIGH RISK: Admit at/refer to facility with NCU. - Dispensary: Refer - Health Centre: Admit or Refer			
	b) HIGH RISK: Immediate administration of IM/IV antibiotics.			
	c) AT RISK: Use observation chart			
	d) AT RISK: Weigh < 2.5kg: Admit at/refer to facility with KMC - Dispensary: refer to facility with NCU			
	e) NO RISK: Prepare for counselling and discharge			
411.	List actual actions taken for the baby (refer nurse's notes, case records, and any another other baby records in use at the facility			
	a)			
	b)			

	c)		
	d)		
	e)		

Was the observational chart completed? (If yes, complete items checked)

SECTION V: Observational Chart for Newborn AT RISK - 6 hrly check-up for 48 hrs			
Instructions: For each 'hour after start of observation' write copy the information written under each item. If no information is written, write 'NI' (for No Information). Write any other information in the comment's column.			
#.	**Item**	**Responses**	**Comments**
501.	**0 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 0 hrs		
502.	**6 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 6 hrs		
503.	**12 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 12 hrs		
504.	**18 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 18 hrs		
505.	**24 hours**		

	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 24 hrs		
506.	**30 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 30 hrs		
507.	**36 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 36 hrs		
508.	**42 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 42 hrs		
509.	**48 hours**		
	a) Time of check-up	Hr: _____ Min: _____	
	b) Temp (°C)		
	c) Respiration (/min)		
	d) Feeding (1=well, 2=not well)		
	e) Movements (1=normal, 2=not normal)		
	f) Weight (every 24 hrs)		
	g) Chart not completed at 48 hrs		

10.3.2. Qualitative interview guide

Assessment of the Neonatal Triage Checklist (NTC)

MASTER INTERVIEW GUIDE_**ALL QUESTIONS**

Target Respondents:
- *Care providers using the NTC at Mbeya Regional Referral Hospital (MRRH).*
- *Members of the hospital management team who are aware of the NTC and who play any role in managing and/or supervising quality of care given to the newborn babies at MRRH.*
- *Members of the regional, district and/or hospital management team who are aware of the NTC and have been conducting supportive supervision and/or mentorship of care providers working in the maternity, labor and/or neonatal units.*

Information to the interviewer:
- *Interviewers should spend a few minutes building rapport with the respondent.*
- *Thereafter use appropriate consent form to obtain the participant's consent for participation in the interview.*
- *If respondent agrees to be interviewed, obtain consent for voice recording and begin the interview.*

Instruction to the Interviewer: Complete below information before turning on the audio recorder.

Region: _____

District: _____

Interviewer Name: _____

Respondent's ID: _____

Position: _____

Organization: _____

Location of the interview: _____

Date of the interview: _____

Start Recording by spelling loud into the recorder, the date, interview location and respondent category/position. You may also say the time of the day that the interview was started.

<u>For example</u>: *"Today on 22nd May 2018, I am at Mbeya regional referral hospital, conducting an interview with a labour and maternity care provider. Now, it is 1.15pm"*

INTERVIEW QUESTIONS

SECTION A: Introductory questions and knowledge about the NTC intervention

1. In a nutshell, can you tell me the roles you play in relation to the maternity, labor and newborn services at MRRH?

2. What are the main challenges facing services provided to the mothers coming to deliver at MRRH and their newborns?

3. Are you familiar with the newborn triage checklist?
    a. If not, end the interview
    b. If familiar with the NTC, continue with question no. 4

4. What challenges do you think the NTC is trying to solve?

SECTION B: Perception of the usefulness of the NTC intervention

5. What is your perception of the usefulness of the NTC towards care provided to the newborns at MRRH? Pls explain.

6. Have you noted any improvements in the care provided to the newborns at this hospital as a result of using the NTC?
    a. If yes, what improvements?
    b. If not, why do you say so?

SECTION C: Barriers, Challenges and Facilitating, and Motivating Factors for Using NTC

7. Are NTC cards always available when needed for use at MRRH?
    a. If not, why do you think they are not available sometimes?

8. What challenges do care providers face in using the NTC cards when they are available?

    If not mentioned Probe for the following:
    a. Skills of care providers on the correct use of the NTC cards
    b. High workload
    c. Does not see the need to use the card/the meaning in using the card

9. What makes care providers at MRRH not use the NTC cards even when available? *(for each item mentioned ask how it is a barrier to the use of NTC cards)*

10. What facilitates care providers to use the NTC cards?

    If not mentioned Probe for the following:
    a. Skills of care providers on the correct use of the NTC cards
    b. Availability of the NTC cards
    c. Reasonable workload

11. What are the motivating factors among care providers for using the NTC cards?

12. How use-friendly is the NTC card?
    a. Are there any changes that, if made, would make the NTC card more user friendly?

b. If yes, what are these changes and how would they make the NTC card more user-friendly?

SECTION D: Training, Mentorship & Supportive Supervision

13. Have you/care providers received any training on the use of the NTC card?

14. If yes, where did you/care providers receive the training from?

15. What do you think about the training that you/care providers received on the use of NTC cards?
    a. Was it sufficient?
    b. If not, why do you say so?

16. Do you/care providers receive mentorship and/or supportive supervision related to the use of the NTC cards?
    If yes:
    a. How frequent?
    b. Where does it come from?
    c. How helpful is it? Why do you say so?

17. Are there any aspects of the NTC card use that you/care providers would like to receive further training on?
    a. If yes, what aspects of NTC card that you still like to receive training on?

SECTION E: Availability of Other Interventions Targeting Improvement in Newborn Care

18. Are there other interventions targeting improvement in newborn care that were initiated at MRRH between 2015 and now?
    If yes: Can you tell me more about each of the interventions? (*probe on all items below for each intervention mentioned*)
    a. What is the intervention aim and key approaches used for achieving the mentioned aim?
    b. When was the intervention initiated at MRRH?
    c. Is the intervention still operating at MRRH? If not, when was it ended?
    Make sure to probe (ask all probes above) for the Newborn Care Unit (NCU) if not mentioned.

19. I understand that the NTC was introduced around one year after establishment of the NCU at MRRH. What do you think about the contribution of each of the two interventions towards noted improvements in newborn care *(if mentioned)* at MRRH?
    Probes:
    a. Would similar improvements in newborn care happen if only the NCU was present at MRRH (without use of the NTC card)? Why do you say so?
    b. Would similar improvements in newborn care happen if only the NTC card was being used at MRRH (without presence of the NCU)? Why do you say so?