Using Neonatal Early Warning System (NEWS) in PMGH, SCN

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Introduction

- Worldwide there are about 2.4 million babies that die before the 28th day of life.(8)
- According to the Paediatric Annual Mortality and Morbidity Report in PNG, case fatality for neonates is 5.9% in 2021.(5)

- As part of improving care for the neonates, recommendations were made to use color-coded observation charts to assist in identifying sick children. (5)

- Even though, in PNG, there is a color-coded chart formulated and used for children, there are none tailored for neonates.

- There are no published studies describing the use of color-coded, track and trigger system in Papua New Guinea.

- **Aim:**
  - To describe the use of a Neonatal Early Warning System (NEWS) to identify neonates at risk and to promptly escalate care.

- **Primary Outcome:**
  - Assess the number of patients that had abnormal observational vitals and their outcomes, using NEWS.
- **Secondary Outcome:**
  - Nursing Staff Perception on the usage NEWS in SCN.

Methodology

Study Design:

1. Prospective descriptive study of the use of NEWS
2. Qualitative Study to look at nursing staff perception, after using the NEWS

Study Site:

- PMGH, SCN

Study Duration:

- Data collected from 01 May 2022 to 30 June 2022

Population and Sample Size:

- Neonates admitted to SCN who met the inclusion criteria
- Total of 157 recruited

Methodology

- Tools Used:
  - A color coded observational form adapted from the Plymouth Hospital Neonatal Early Warning System chart. (7)
  - A separate data collection form was used to gather data.

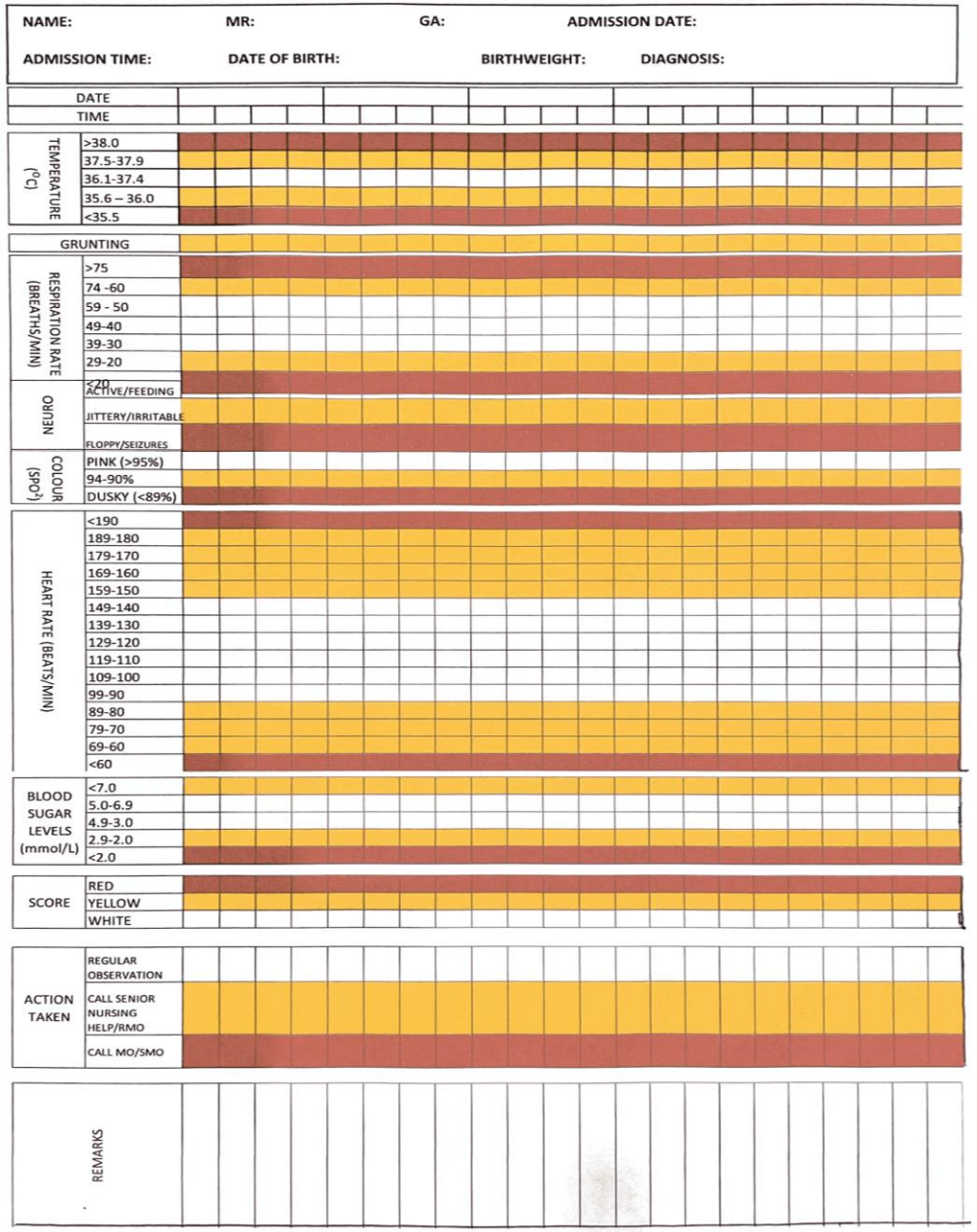


Fig 1: Neonatal Early Warning System (NEWS) Color Coded Observation form. Adapted from the Plymouth Hospital Neonatal Early Warning System

Methodology

Inclusion Criteria:

- All babies born in PMGH labour ward, having risk factors admitted to nursery between the study period.
    - Risk Factors were identified routinely by the attending Paediatric team, (SMO, MO or RMO) and the decision for admission was at the teams discretion using SCN guidelines.

Exclusion Criteria:

- Babies older than 72 hours
- Babies having congenital structural abnormalities of the respiratory and cardiovascular system.
- Re-admissions to Nursery
- Current Inpatients in the Nursery

Methodology

- Prior to study period, a presentation on how to use NEWS observation chart was given to the nurses working in SCN.
- NEWS observation chart was included in with a new admission chart by the ward clerk.
- Vital observations were taken using routine practices, with same equipment available in the nursery during the study period.
- ONLY vitals signs falling in the RED zones were collected recorded as TRIGGERS.

Methodology

- Neonates were followed up until 72 hours of admission in nursery, and an outcome recorded after 72 hour period.

- Characteristics of neonates with admitting diagnoses were collected and entered into Microsoft Excel 2019.

- Characteristics were summarized descriptively using frequency tables and percentages for categorical variables. Odd ratios p-values were calculated using Epi Info 7.

- No informed consent was sought as no NEW intervention was given to the patients, as well as no NEW equipment was used on the patients.

Using the Neonatal Early Warning System

- If, 1 vital sign falls into the yellow zone. Repeat same vital after 30 mins
- 2 vital signs falling in the yellow zone prompts review by a Senior Staff.
- Vital Signs falling in the red zone prompts IMMEDIATE REVIEW by the on call medical team, with appropriate interventions to be carried out.

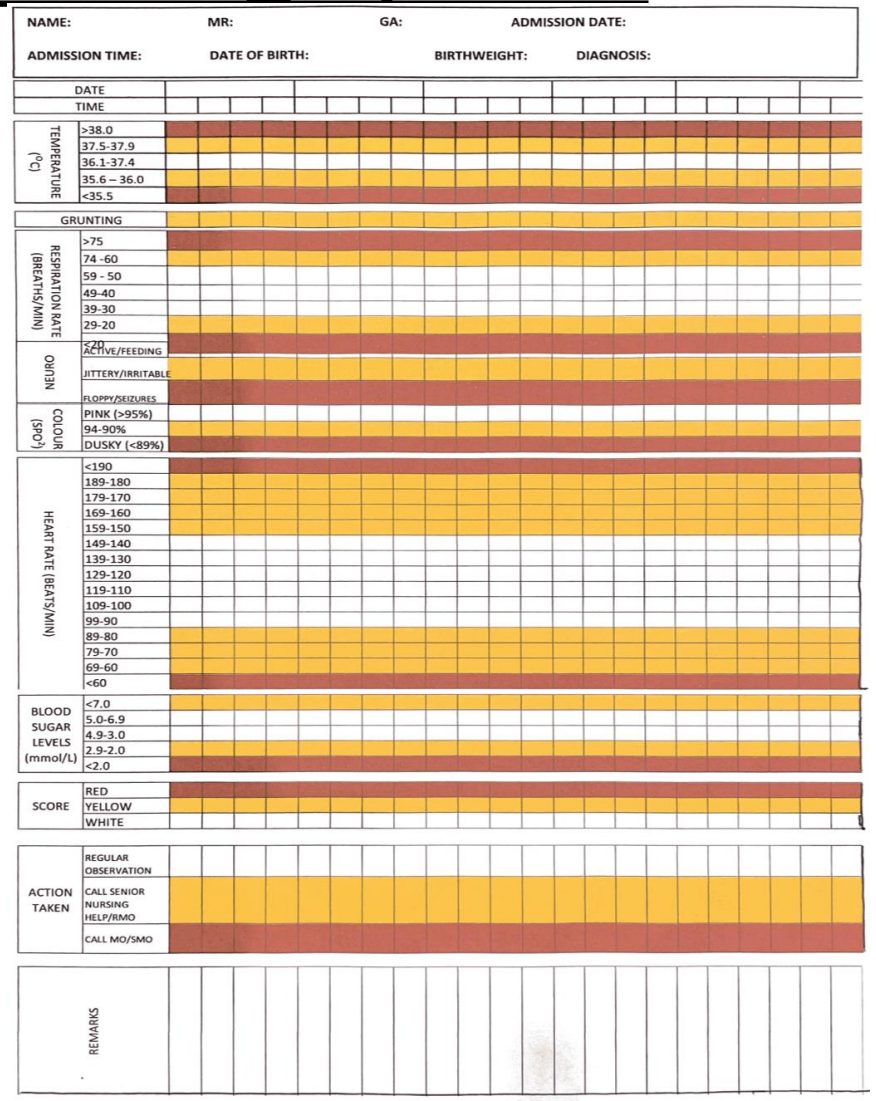


Table 1: Current Clinical Practice of Interventions done by nurses in PMGH SCN

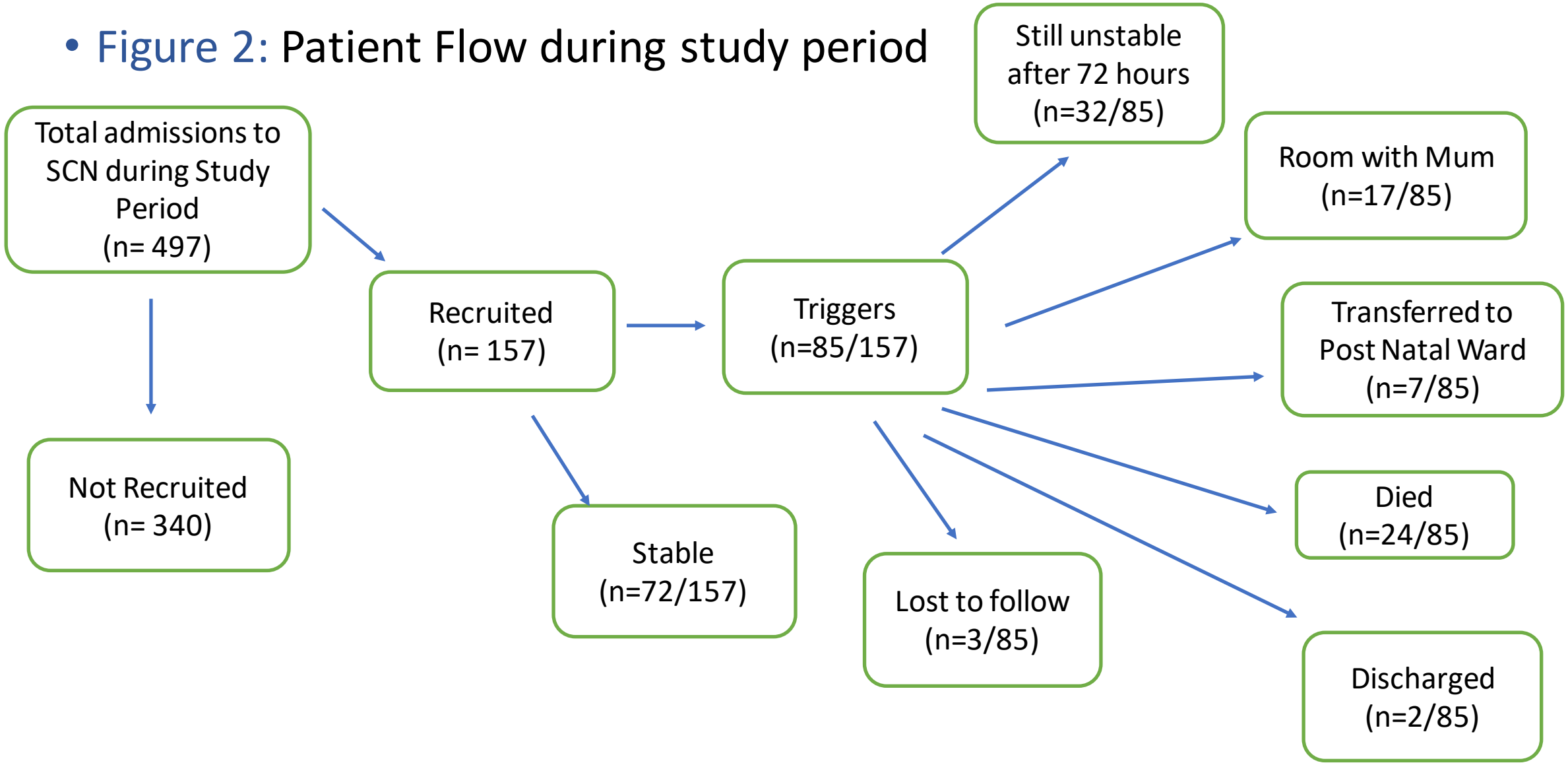
Physiological Vital	Intervention
FEVERS	Cool Sponge. Turn off warmer if the child is under it.
HYPOTHERMIA	Wrap in blanket. Put under Warmer. Advise mother to do KMC
GRUNTING	Administer Oxygen (via Nasal Prongs)
TACHYPNOEA	Administer Oxygen (via Nasal Prongs)
BRADYPNOEA	Administer Oxygen. Assisted Bag and Mask
SPASTICITY/FITTING	Administer Paraldehyde(0.2 mls/kg), check sugars and temperature, notify MO/SMO
FLOPPY	Check Blood Sugar Levels and to Notify MO
DUSKY/CYANOSIS	Administer Oxygen (Usually via Nasal Prongs)
TACHYCARDIA	Check temperatures and Notify MO
BRADYCARDIA	Notify MO
HYPOGLYCEMIA	Give 1 ml/kg 50%dextrose and notify MO
HYPERGLYCEMIA	Stop and fluids with glucose (Usually 10% dextrose) and 0.9% Saline and

Secondary Aim

- As part of the secondary aim nurses were asked to provide feedback via a structured questionnaire using the Lickerts scale.
- A total of 13 staff working during the study period in nursery, participated in the giving feedback.
- Data was also collected with a separate data collection form.
- Data was entered into Microsoft Excel 2019 and expressed descriptively using frequencies and percentages.

Results

- Figure 2: Patient Flow during study period



Characteristics of Neonates Recruited

Table 4: showing characteristics of neonates recruited

TOTAL (n= 157)	STABLE % (n =72)	TRIGGER % (n = 85)
SEX		
female	41.65% (30)	56.47% (48)
male	44.44% (32)	43.53% (37)
not recorded	13.89% (10)	0% (0)
GESTATIONAL AGE		
Less than 37/40	26.34% (19)	36.47% (31)
Greater than or equal to 37/40	47.22% (34)	50.59% (43)
not recorded	26.39% (19)	12.94% (11)
BIRTH WEIGHTS		
Less than 1kg	5.56% (4)	7.06% (6)
1kg to 2 kg	26.38% (19)	34.12% (29)
2kg to 2.5kg	16.67% (12)	14.12% (12)
More than 2.5kg	48.61% (35)	44.71% (38)
Weights not recorded	2.78% (2)	0%(0)
DELIVERY MODES		
Normal Vaginal Delivery	66.67% (48)	85.88% (73)
Caesarean Section	15.28% (11)	9.41% (8)
Not Recorded	18.06% (13)	4.71%(4)

Diagnoses

Table 5: Diagnoses of two groups of patients recruited

DIAGNOSIS STABLE (n=72)	(n)	%
MAS	2	2.35%
Prematurity with complications	7	8.24%
IUGR with complications	20	23.53%
NNS including NNM/NN PNA/	25	29.41%
Mild BA	8	9.41%
SBA	1	1.18%
TTN	1	1.18%
SGH	1	1.18%
NNS/NNJ	7	8.24%

DIAGNOSES TRIGGER GROUP (n=85)	(n)	%
MAS with Complications	17	20.00%
Prematurity with complications	22	25.88%
IUGR with complications	15	17.65%
NNS including NNM/NN PNA/NN Tetanus	25	29.41%
SBA with complications	6	7.06%

TABLE 4: Proportion of different abnormal vital signs over first 72 hour period, in the Trigger Group

Physiological Abnormality	FIRST 24 HOURS		FIRST 48 HOURS		FIRST 72 HOURS	
Fever (n) %	24/85	28.24%	16/85	18.82%	11/85	12.94%
Hypothermia (n) %	20/85	23.53%	10/85	11.76%	11/85	12.94%
Grunting (n) %	9/85	10.59%	0/85	0.00%	0/85	0.00%
Tachypnoea (n) %	9/85	10.59%	4/85	4.71%	4/85	4.71%
Bradypnoea (n) %	4/85	4.71%	3/85	3.53%	0/85	0.00%
Spasticity/Fitting (n) %	12/85	14.12%	2/85	2.35%	1/85	1.18%
Floppy (n) %	3/85	3.53%	1/85	1.18%	0/85	0.00%
Dusky/Cyanosis (n) %	31/85	36.47%	10/85	11.76%	3/85	3.53%
Tachycardia (n) %	4/85	4.71%	0/85	0.00%	1/85	1.18%
Bradycardia (n) %	1/85	1.18%	1/85	1.18%	0/85	0.00%
Hypoglycemia (n) %	0/85	0.00%	0/85	0.00%	0/85	0.00%
Hyperglycemia (n) %	2/85	2.35%	0/85	0.00%	0/85	0.00%

Interventions

Table 5: Shows adequacy of interventions in the trigger group.

	(n)	%
APPROPRIATE INTERVENTIONS	47	55.29%
INAPPROPRIATE	38	44.71%
TOTAL:	**85**	**100.00%**

Results

Table 6: Outcomes of Patients after 72 Hours

OUTCOMES	STABLE GROUP (n= 72)	TRIGGERS (n=85)
Still unstable after 72 hours	15.27% (11)	37.65% (32)
Room with Mum	30.56% (22)	20% (17)
Transferred to Post Natal Ward	23.61% (17)	8.24% (7)
Died	9.72% (7)	28.24% (24)
Discharged	15.27% (11)	2.35% (2)
Absconded	1.39% (1)	0% (0)
Outcome not recorded (LTFU)	4.16 (3)	3.53% (3)

Results

- Neonates that had triggers were **3.65** times more likely to die as compared to neonates that were stable and didn't fall into the red zone.(**28.23% vs 9.72% p-value 0.003).**

RESULTS FOR THE SECONDARY AIM

A total of 13 nursing staff that worked in SCN, participated in filling out a structured questionnaire form.

Questions were group 4 categories

- Usability of the form
- Monitoring and Interpreting of abnormal vital signs
- Management of abnormal vital signs
- Communicating escalation of care

- Response rate 100%

TABLE 7: Responses to the Usability of the form

USABILITY OF THE FORMS	STRONGLY DISAGREE	DISGAREE	AGREE	FULLY AGREED
I find the NEWS observation form user friendly	7.69% (n=1/13)		15.38% (n=2/13)	79.92% (n=10/13)
I find the NEWS observation form can help in identifying sick neonates quickly	7.69% (n=1/13)			92.30% (n=12/13)
I understand the color-coded lines.			15.38% (n=2/13)	84.62% (n=11/13)
I find the forms and font size clear enough for A4 size	7.69% (n=1/13)			92.30% (n=12/13)

Table 8: Nurses response to the usage of equipment and understanding vital signs

USAGE OF EQUIPMENT, AND UNDERSTANDING VITALS	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
I understand how to correctly use a digital thermometer to measure temperature				100% (n=13/13)
I understand how to correctly use a pulse oximeter to get oxygen saturation and pulse rate				100% (n=13/13)
I understand how to use a blood glucose machine to measure sugar levels	7.69% (n=1/13)			92.30% (n=12/13)
I understand how to measure the respiratory rate of neonates	7.69% (n=1/13)			92.30% (n=12/13)
I understand the normal ranges for each of the vital signs	7.69% (n=1/13)			92.30% (n=12/13)
I can easily attend to a neonate with fever	7.69% (n=1/13)			92.30% (n=12/13)
I can easily manage a neonate with hypothermia	7.69% (n=1/13)			92.30% (n=12/13)

Table 9: Nurses response in the management of neonates with abnormal vital signs.

MANAGEMENT OF A NEONATE WITH AN ABNORMAL VITAL	STRONGLY DISAGREE	DISGAREE	AGREE	FULLY AGREED
I can easily manage a neonate with cyanosis and respiratory distress	7.69% (n=1/13)		15.38% (n=2/13)	76.92% (n=10/13)
I can easily manage a neonate that has an apnoeic attack	7.69% (n=1/13)			92.30% (n=12/13)
I know what to do immediately when a neonate is fitting				100%(n=13/13)
I know what to do when a neonate is not feeding properly	7.69% (n=1/13)		7.69% (n=1/13)	84.62% (n=11/13)
I can easily manage a child who has hypoglycemia	7.69% (n=1/13)		7.69% (n=1/13)	84.62% (n=11/13)
I can manage a neonate who has had a cardiorespiratory arrest.	7.69% (n=1/13)		15.38% (n=2/13)	76.92% (n=10/13)

Table 10: Nurses response to communication and escalation of care for sick neonates

COMMUNICATION:	STRONGLY DISAGREE	DISGAREE	AGREE	FULLY AGREED
I feel I am able to discuss sick neonates senior colleagues easily.			15.38% (n=2/13)	84.62% (n=11/13)
In an emergency, I am able to get through to the on-call resident easily from nursery			15.38% (n=2/13)	84.62% (n=11/13)
In an emergency, I am able to get through to the on-call medical officer easily from nursery			15.38% (n=2/13)	84.62% (n=11/13)
When needed I am able to get through to the on-call SMO easily from nursery			23.08% (n=3/13)	76.92% (n=10/13)

Discussion

- This study has shown that NEWS can be an adjunct tool in clinical management of neonates in the nursery. Studies conducted in LMIC have also concluded that it is an essential tool to help with identifying sick neonates. (1-4)

- Temperature changes were the main physiological vitals that fell into the RED zone quickly.
  - Prevalence of hypothermia in our study were lower(23.5 %) as compared to another studies Mitchel *et al* in Kenya were hypothermia accounted for (38%). (4)

  - It was also lower than the prevalence 32%-85% as described in a large systemic review of hypothermia in 2013 by Lunze K *et al.*(3)

Discussion

- Our study showed that it had the 36% prevalence of cyanosis in the first 24 hours. However studies done globally have also found that cyanosis in the newborn may persist for 24-48 hours after birth.

- Most of cyanosed children also had tachypnoea and grunting in the first 24 hours, with equal prevalence rates of 10.59% respectively. Which is higher than the 2.9 % to 7.6% as described by *Prishand et al* in 2004. (8)

    - This could be due to the high number of babies with RDS and prematurity born during the month of may and having deaths after 24 hours of life.

- Patients that had more vitals in the RED zones were more likely to have an unfavorable outcome as compared to stable patients.

Views from Nursing Staff

- Nursing staff perception on the usability of the form was generally positive about 79.9% fully agreed on it being user friendly (n= 10/13) similar to a study conducted by Roland *et al*, were (11/13) nurses who participated in a questionnaire said that similar neonatal early warning charts were beneficial.(7)

- Most of the nursing staff were confident in using digital thermometer, pulse oximetry and blood glucose machines (92.63%, n=10/13), and interpreting the abnormal values.

- There is an ease of communication between the nurses and doctors on call when dealing with a deteriorating neonate. (84.65%, n=11/13)

Limitations:

- Missing information on characteristics from patient charts.
- Positive response bias by the nursing staff.
- Two week delay in getting color-coded charts printed. Patients admitted in those two weeks were not recruited.
- Cost of printing 100 sheets A4 size = K220 –Theodist.
- Death occurring after 72 hours were not captured in the study.
- Month of May had a lot of deaths overall in SCN. Most of the deaths were within the first 24 hours of life.

Conclusion

- This study has given an insight on using a track and trigger system for escalation of care for a sick neonate.

- Even though it can be used as tool to identify at risk neonates, there has to be proper training on its use and the adequate knowledge on the escalation of care, before implementing it in SCN.

- A more detailed feasibility study on the costs and benefits of using these charts long term.

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