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Hypothermia in neonate: An underlook problem

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Abstract

Aims and objective: Body temperature of a neonate continues to be under-documented, under-recognized, and under-managed, even though studies have shown that neonatal hypothermia increases mortality and morbidity. We studied and analyzed temperature control (thermal chain) from point of referral to admission in NICU and overcome the pitfalls in management thorough serial PDSA (plan-do-study-act).

Material and methods: Prospective observational analysis done over a period of 1 year. Study conducted in 3stages. In 1st stage protocol planned to record the temperature of all babies within 15min of admission. In the 2nd stage quality team formed and point of referral, mode of transport, and casuality stay were added. In 3rd stage management of temperature at casuality, referral point and in NICU was included.

Results: In the 1st stage of study 93% adherence to protocol was seen and 58.6% of patient presented with moderate hypothermia and 24.1% patient having cold stress. As study progressed in 2nd stage, compliance increased to 96% but 73% cases were still not in the normal range of temp. Management of hypothermia was not done appropriately and 24% cases remain hypothermia on reaching NICU. Casuality stay was 69min. After subtle changes in infrastructure compliance increased to 100%, and time taken to note temperature was 2min. Average waiting time to casuality was decrease to 15min, and Normothermic cases coming through ambulance increased to 70%.

Conclusion: This is live example which shows how a unit has built steps from basic change ideas of recording temperature to a comprehensive chain of ideas in maintaining thermal chain from the point a baby is received.

Keywords: PDSA cycle, Hypothermia, Preterm, Quality improvement

Introduction

Conventional practice for the prevention of heat loss in the delivery room has been in place since almost 1966 and includes placing the newborn under a radiant warmer and drying them quickly.[1,2] Several methods to reduce heat loss in the delivery room, such as coating the infants skin with paraffin,[3,4] heat shields or plastic hoods,[5,6,7] and plastic wraps or blankets, [8,9,10,11] have been investigated.

Studies from the 1970s demonstrate that core body temperatures can drop 2_C to 3_C in the first 30 minutes of life.[12] The body

temperature of premature infants drops precipitously after birth because of their disproportionate body mass-to-surface ratio, exposed body posture, decreased amounts of subcutaneous fat, poor vasomotor control, and thin skin with increased permeability.[13,14,15]

Hypothermia (with increased need for thermogenesis) occurring during the adaptation to extrauterine life presents increased demands for oxygen during a period of time when oxygen delivery may be compromised. In addition, in VLBW infants, increased glucose needs may be coupled with inadequate stores and a lack of dextrose delivery due to delays in intravenous access. Therefore, cold stress can be associated with increased oxygen demands, respiratory compromise, and hypoglycemia. With hypoxia, the infant utilizes anaerobic metabolism resulting in metabolic acidosis and pulmonary vasoconstriction. This effects pulmonary vasomotor tone and can lead to a viscous cycle leading to decreased cardiac output, acid-base abnormalities, shock, coagulation defects, altered cerebral blood flow leading to severe intraventricular hemorrhages, necrotizing enterocolitis, acute renal failure, and sometimes death.[16,17,18]

Though hypothermia management is a basic skill, required for a successful neonatal intensive care , the problem is under look. The awareness to the paramedic about the ill effects of hypothermia and running a PDSA cycle to understand and manage the situation will help a lot.

Aims and objective

We studied and analyzed temperature control (thermal chain) from point of referral to admission in NICU and overcome the pitfalls in management through serial PDSA cycle(plan-do-study-act)

Material and methods

Prospective observational analysis was done over a period of 1 year. Study conducted in three stages. In 1st stage Quality team was formed and protocol planned to record the temperature of all babies within 15minutes of admission. In the 2nd stage point of referral, mode of transport, and casuality stay were added. In 3rd stage management of temperature at casuality, referral point and in NICU was included.

Results

In the 1st stage of study, Aim was defined, Quality team was formed, indicators were identified, and measuring system was created. This stage lasted for 5months.

93% adherence to protocol was seen and 58.6% of patient presented with moderate hypothermia and 24.1% patient having cold stress (**Fig 1**/**Fig 2**).

We identified a critical thing that 85.9% are not coming under normal ranges of temperature. This was an eye-opener to the team to know the importance of data collection. After analysing the data quality team had decided to add points like referred hospital, mode of transport and temperature of baby after reaching Neonatal intensive care unit.

In stage 2 it was surprised to see that although compliance was 85%, (decreased from stage 1 compliance) (**Fig-3**) around 73% of cases are coming which are not in the normal ranges of temperature (**Fig-4**).

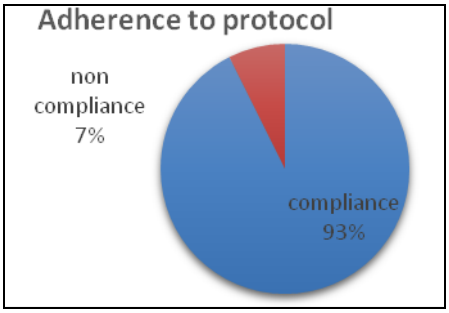
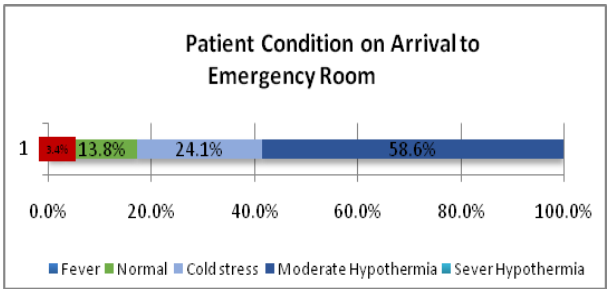


Figure 1



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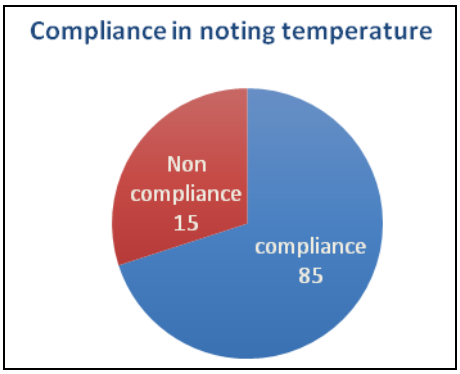

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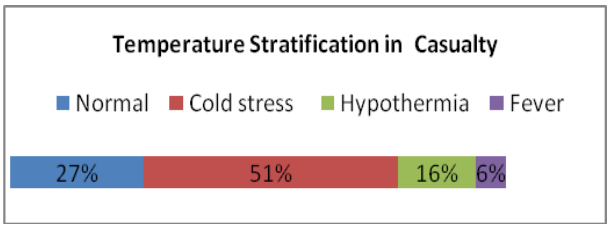
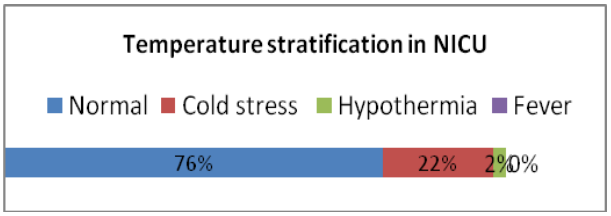


Figure 4



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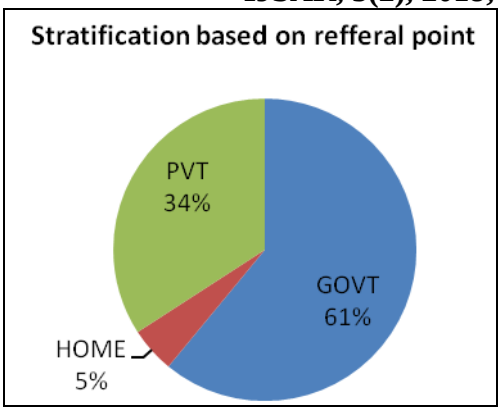

Figure 6

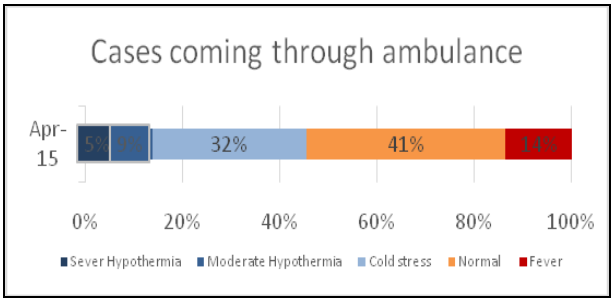

Figure 7

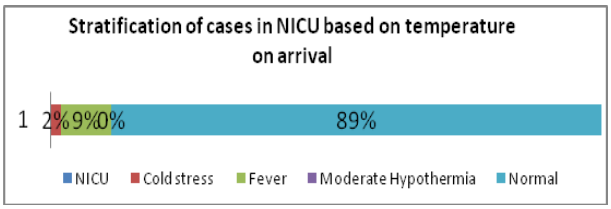

Figure 8

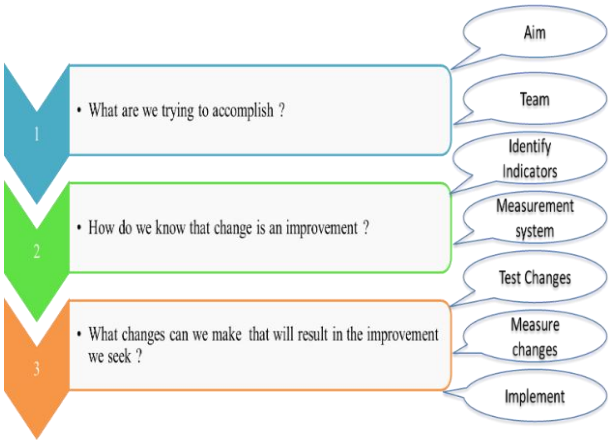

Figure 9

Management of hypothermia was not done appropriately and 24% cases presented with hypothermia in Neonatal intensive care unit after been stabilized at casualty (**Fig-5**). On an average 84% of cases came with cold stress to fever.Around 61% cases came from Government hospital(**Fig-6**). About 83% of cases were transported in ambulance, out of which 60% were hypothermic(**Fig -7**).

In stage 3 we made a protocol that baby if diagnosed as hypothermic or cold stress, then baby would be kept at triage bed until stabilized and then would be shifted to Neonatal intensive care unit. The team also added two extra points to the existing protocols that is

- Casuality stay
- Managing babies coming with various temperature through ambulance.

Compliance increased to 96% this time, after creating a triage, 91% of cases were stabilized before going in to NICU(**Fig-8**) and an average causality stay was 69min.

Small changes like awareness about the temperature measurement , using plastic cover, clothes and embrace during transport (intrahospital and interhospital), and decreasing casuality stay, warmer placement in casuality away from doors lead to significant change.

In addition to it ,we also took measures which involved training of Ambulance technical staff who accompany the baby regarding hypothermia and its management.

Compliance increased to 100%, and time taken to note temperature was two minutes. Average waiting time to casuality was decrease to 15 minutes , and normothermic cases coming through ambulance increased to 70%.

Discussion

Standard care includes providing a warm delivery room at a minimum of 25°C (although rarely achieved in practice),drying the infant thoroughly, immediately after birth (especially the head) , removing any wet blankets, wrapping in a pre warmed blanket, pre warming any contact surfaces, eliminating draughts and close proximity to outside walls. If available, radiant warmers for resuscitation and stabilization allow easy access and are effective in preventing heat losses, provided that the infant is immediately dried and placed under the pre warmed heater. Although the infant gains heat by radiation, there are increased potential losses through convection and evaporation and these losses are exacerbated if the infant is inadequately dried.

Most important aspect of any quality improvement programme is to have a methodology. Here the initial steps were to define aim, form a team, identify indicators , and create a measuring system. (**Fig-9**)

Most important step that everyone has to follow in creating an aim is that it should be "SMART"

S-Specific M-Measurable A-Attainable R-Relevant T-Time Bound.

The methodology used for this study was based on model of improvement which is adopted by IIH (institute for health care improvement). Although management of hypothermia is a a simple and mandatory protocol which has to be followed, sometimes due to heavy case load and other clinical issues we miss out some some of the key check points which otherwise assumed to be in place. So this methodology has helped us in identifying those checkpoints or areas by continuing brainstorming along with team and running various PDSA cycle in those identified areas and collecting data which had ultimately led to an end to end management of hypothermia. Some of the key benefits which are seen by following this kind of methodology is it creates a scope of continuous improvement in streamlining the process. The PDSA cycle can be a main pillar for quality improvement in NICU. Many areas can be covered with a simple PDSA cycle , which makes active involvement of paramedics , and ultimately

leads to a successful incorporation into the system. KMC, Early CPAP in delivery room , earlier introduction of breast milk for premature babies, are few examples where this methodology can give maximum results.

Once the process is in place and proves to be better in bringing effective outcome then it becomes a protocol which is imbibed into the system**.**

Conclusion

This methodology has helped us in identifying those checkpoints or areas which are missed and by continuing brainstorming along with team and running various PDSA cycle in those identified areas and collecting data, which had ultimately led to an end to end management of hypothermia. Some of the key benefits which are seen by following this kind of methodology is it creates a scope of continuous improvement in streamlining the process.

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Conflict of interest: NIL

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