
REGULATING THE EXPOSURE TO CONTINUOUS BRIGHT LIGHT IN THE NEW BORN UNIT: A CHANGE PROJECT AT MOI TEACHING AND REFERRAL HOSPITAL, KENYA

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ABSTRACT

Introduction: Neonates especially the premature are affected by many factors. Neonatal circadian rhythm, growth and feeds retention is influenced by environmental characteristics that can be changed. Infant oral feeding is significantly improved by lower light levels. However, this has not been put in place in most Newborn care Units in Kenya.

Methods: This was a change process done at Moi Teaching and Referral Hospital's newborn unit. The administrator of pediatric department, head of the department (HOD) at New-Born Unit (NBU), the nurse manager, the ward in-charge, nurse in charge of supplies, biomedical officer at NBU and the clinical nurse educator were involved. The change project required some resources and processes.

Findings: At the Newborn Unit at the Moi Teaching and Referral hospital, the available strategies on use of continuous lighting at the NBU were found to be underutilized by the health care providers due to lack of conviction by the decision makers and the professional leaders. In addition, there was a major challenge in the provision of bed side task lighting hence overhead electric tubes are used during procedures even for one neonate.

Conclusion and Recommendations: The change project sensitized the health care providers on the benefits of cycled light environment for neonates especially for the preterm neonates and encouraged utilization of natural light as much as possible in the ward unless during performance of procedures in need of bright light. The project recommended that all newborn unit staff should adopt nursing neonates in cycled light for researches have proved that it shortens length of stay in hospital.

Key Words: light, newborn unit, MTRH, Kenya, change

Introduction

The pregnant woman is exposed to variable intensities of lighting and sound and in general, lower levels at night. Some of the lighting and sound reaches the fetus in the womb and induces circadian rhythms. Circadian is a term used to describe biological processes that recur naturally on a 24-hour basis. The term circadian was introduced in the 1950s by Professor Franz Halberg (Halberg, 2003).

Circadian clocks are believed to have evolved in parallel with the geological history of the earth and have since been fine-tuned under selection pressures imposed by cyclic factors in the environment (Paranjpe, 2005). All species on the planet are exposed to 24-hour patterns of light and darkness as the earth rotates. In response to these regular, daily oscillations to the natural light-dark cycle, these species have evolved endogenous circadian rhythms that repeat approximately every 24 hours. Circadian rhythms are observed in virtually all aspects of mammalian function, from expression of genes to complex physiological processes (Sukumaran, 2010).

The circadian rhythm influences the rhythmic production of several hormones (melatonin, cortisol and growth hormone), respiratory and cardiac function, sleep-wake state, the level of alertness and body temperature (Seron-Ferre, 2001). The circadian clock in mammals is located in the supra-chiasmatic nuclei in the anterior hypothalamus and is present by 18 weeks of gestation. This master circadian clock organizes and orchestrates the timing of all biological functions, from complicated

physiological systems to single cells (Rea, 2010).

Maternal rest-activity patterns may function as entraining signals for the fetus, as documented in animals and include changes in heart rate, serum cortisol, melatonin levels and body temperature.

After birth, preterm infants are cared for in an environment that has no planned light-dark cycles or any other circadian entraining signals. Infants are exposed to either continuous bright light, continuous near darkness or an unstructured combination of the two. At the newborn unit, Moi Teaching and Referral Hospital, neonates were exposed to continuous bright light throughout the 24 hours.

The use of natural light during the day was never utilized because electric light was never controlled by the health care providers. The change project endeavoured to sensitize the health care providers on the benefits of cycled light environment for neonates especially for the preterm neonates. It was also aimed at encouraging utilization of natural light as much as possible in the ward unless during performance of procedures that needed bright light.

The aim of the project was to implement a change process to regulate the exposure to continuous bright light to all neonates admitted in the new born unit at Moi Teaching and Referral Hospital. Specifically, the project was to determine the availability of side lights in all wards in newborn unit at Moi Teaching

and Referral Hospital and eye pads for use during procedures at the NBU, develop a protocol in regards to the maintenance of cycled light environment in NBU and identify a mechanism of training all health care providers at NBU on the importance of cycled light environment in NBU.

Methods

The Theoretical Framework used in the study was the Kurt Lewin's Change Model



Figure 1: Kurt Lewin's Change Model

Kurt Lewin's model on change management which includes three stages: Unfreeze, Change and Refreeze. He looked at change as a process with distinct stages, and one can prepare self on what is coming and make a plan to manage the transition. As he puts it, "motivation for change must be generated before change can occur."

Unfreezing: Preparing a group to accept change involves the breakdown of the existing status quo before building up a new way of operating. In the intended change project, the motivation behind it was the evidence based research practice that showed that, the circadian rhythm influences the rhythmic

production of several hormones (melatonin, cortisol and growth hormone). Respiratory and cardiac function, sleep-wake state, the level of alertness and body temperature neonatal circadian rhythm, growth and feeds retention is influenced by environmental characteristics that can be changed. In addition, infant oral feeding is significantly improved by lower light levels. At the newborn unit, Moi Teaching and Referral Hospital, neonates were exposed to continuous bright light throughout the 24 hours and the use of natural light during the day was never utilized because electric light was never controlled by the health care providers.

The change project endeavoured to sensitize the health care providers on the benefits of cycled light environment for neonates especially for the preterm neonates. It was also aimed at encouraging utilization of natural light as much as possible in the ward unless during performance of procedures that needed bright light.

Change: In order to accept the change people need to understand how the changes will benefit them. Communication to the midwives and healthcare providers in the newborn unit through continuous professional development and through health education of mothers will help initiate the change.

Refreeze: the outward sign of the refreeze will be the practice of utilization of natural light as much as possible in the newborn unit environment unless during performance of procedures that needed bright light.

Change process

Unfreezing: The change agent discussed the idea with the management team at Moi Teaching and Referral Hospital's newborn unit which is composed of the administrator of pediatric department, head of the department (HOD) at New-Born Unit (NBU), the nurse manager, the ward in-charge, nurse in charge of supplies, biomedical officer at NBU and the clinical nurse educator. All the necessities were reviewed and it was agreed to improvise what is available in the department as follow up for the right resources took place. The required resources included; bed side lights, mobile task lights, eye shades, window curtains, basinet cradles and incubator covers.

The change agent gave a health talk to the health care providers at NBU elaborating the dangers of continuous bright to newborns especially preterm neonates. Such dangers included; retinopathy of premature neonates, prolonged cry, and intolerance of oral feeds, slowed weight gain and prolonged stay in the hospital. Effects of prolonged bright light to staff and mothers such as headache were also elaborated and the staffs were in agreement with the discomfort of continuous bright light. The change agent allowed the health care providers to share freely probable methods of introducing cycled light in NBU. The health care providers demanded all the required resources to be available so as to introduce cycled light.

Change: The change agent steered in improvising what was available in the ward to control continuous use of bright light. The biomed officer was requested to install side light through electric department at least one

in each ward, one bulb for use at night which was successful. The incubators were covered with neonates' linen and it was fitting very well that neonates were never again exposed to continuous bright light. The change agent was encouraged by the appreciation by the health care providers and the management team was amazed by seeing the project implementation workable. The supplies department did not provide window curtains hence well chopped boxes are being used to shade direct light from reaching the neonates. Eye pads are a major challenge to obtained, the change agent introduced improvisation of face masks with black tapes to strip the neonates eyes during a procedure which necessitates bright light. It has been a challenge too to obtain mobile task light hence the team agreed to switch on bright lights during procedures then switch off immediately after the procedure. The health care providers led by the change agent who was backed by the head of the department agreed to assemble and accomplish all procedures within a short time to allow babies rest in natural light.

Re-freezing: To sustain the change, the change agent involved the top management right from the beginning; heath educated the care providers on the dangers of continuous bright light and the benefits of cycled light to the neonate, staff and the parents. There had been continuous education to all new staff and students in the clinical rotation to understand the importance of cycled light and join the team in switching off light after procedures. Posters were put in place to remind each health care provider to switch off lights after procedures and use dim light at night so as to nurse neonates in near to darkness environment.

Findings

There was a lack of availability of side lights in the wards to offer dim light at night when no procedures are going on. This is because the Health care providers were not well acquainted with the rationale of nursing neonates' especially preterm neonates in a cycled light environment and lacked knowledge on how to control light effectively. It was also discovered that there were no available eye pads for use during procedures at the NBU and therefore the neonates were exposed to direct light during procedures.

Findings from the NBU in-charge and Health care workers indicate that there was no facility based policy, strategies and plans related to control of continuous bright light were missing in the wards at the NBU, MTRH. It was also noted that there was lack of continuous health education carried out in order to sensitize the health care providers and mothers on the benefits of nursing neonates in a cycled light environment within the NBU.

Discussion

The findings indicate that a facility based policy, strategies and plans related to control of continuous bright light were missing in the wards at the NBU, MTRH. Agrees with White, (2007) where most Newborn Units, critically ill term and preterm neonates are cared for in an environment that has no planned light-dark cycles. Infants are exposed to bright light continuously day and night. Care givers benefit from moderate levels of ambient light in order to perform tasks and maintain wakefulness.

Near darkness (ND) is practiced in some nurseries because of its similarity to the relative darkness of the uterus. During implementation of change process it was found out that there was lack of side lights in the wards to offer dim light at night when no procedures are going on. This finding is contrary to Brandon (2002) where infants receiving ND are exposed to minimal light throughout day and night except for the time of shift change or handling. Some nurseries define ND as 5 to 10 lux. Light protective devices or dimming the lights are used in order to achieve those settings. This approach overlooks the fact that the fetus develops in an environment that is relatively dark but rich with auditory, tactile and kinesthetic sensory stimuli. These maternal stimuli expose the fetus to circadian rhythms and help in synchronizing the fetal clock with the external light-dark cycle.

There is no protocol or single definition for the time cycles or the maximal and minimal lux lighting used for Cycled Light (CL). CL is usually provided in a 12 hours on (11 to 13 hours), 12 hours off (11 to 13 hours) pattern similar to the changes in natural light outside. There is a minimal time of transition between light and darkness at the change of nursing shifts. A day versus night lighting difference is achieved either by artificial lighting or by using the regular nursery lighting and uncovering windows during the day. At that time the incubator cover is folded on top of the incubator or taken off, achieving 200 to 500 lux lighting or more (Brandon, 2002; Mirmiran, 2003; Begum, 2006). At night-time, windows are covered by dark, lined curtains, lights are dimmed or turned out and the only illumination is low intensity night light (< 30

lux) (Begum, 2006). Eye pads are used to protect the infant when greater intensity light is needed for medical procedures. It is still not clear how early preterm infants in the nursery should be introduced to artificial circadian cycles in order to reach the same level of 'clock' maturity as infants born at term. It has been shown that a higher percentage of circadian rhythms with regard to body temperature and heart rate were found to be appropriate for Gestational Age (GA) infants compared with small for GA, preterm infants (Glotzbach, 1995).

During change process it was evident that there was lack of continuous health education carried out in order to sensitize the health care providers and mothers on the benefits of nursing neonates in a cycled light environment. This finding is contrary to other studies where the presence or absence of circadian rhythms in the newborn infant probably results from the combined influence of antenatal and postnatal environmental conditions (Mirmiran, 2000). The postnatal development of human circadian rhythms may be hampered by maternal, fetal or perinatal disturbances. This is observed when the intimate mother-fetus relationship is dramatically altered by preterm birth. Preterm infants are deprived of several important postnatal maternal entrainment factors and they are exposed to continuous bright light or irregular light for several weeks or months in the (Neonatal Intensive Care Unit) NICU. This lack of maternal entrainment, the exposure to irregular extra uterine lighting and care in the nursery may contribute to the disturbances in body temperature, sleep and feeding patterns that are commonly experienced by preterm infants (Keener, 1988;

Thoman, 1989a; Thoman, 1989b). Using artificial entraining signals in the nursery, that is CL, may prevent those disturbances and help in promoting growth as well as preventing other morbidities. CL has the potential to promote circadian rhythms that have health benefits, including hormonal regulation, activity-rest cycles and vital sign regulation, with the potential of promoting infant growth (Kennaway, 1992; Rivkees, 2003). CL could increase the satisfaction of care experienced by parents and healthcare providers and thus have an indirect beneficial effect on the infant.

Conclusions and Recommendations

The change project on use of cycled light at the Newborn Unit at MTRH seemed feasible and the following were achieved: - The biomedical department ensured each ward had a working bed side light to be lit only at night, and ensured the neonates were nursed in cycled light. The supply department were able to supply incubator covers hence all incubators had covers to protect the neonates from bright light. Posters were pinned everywhere at the newborn unit reminding the health care providers to switch off bright light after every task and enhance growth of the neonates especially the preterm. The clinical nurse educator initiated a programme of mentoring all the newly deployed staff at the newborn unit and the benefits of nursing neonates in a cycled light are included. The mothers were health educated on the benefits of nursing their neonates in cycled light hence they would remind the healthcare providers to switch off light after a task for their comfort and that of the neonate.

The study recommended that all NBU staff to adopt nursing neonates in cycled light for research has proved that it shortens length of stay in hospital. Secondly, there is need for the NBU staff to be innovative to ensure neonates are given their rights of care for growth. A policy needs to be developed to reinforce the care of neonates in cycled light. Continuous health education to all the population within the NBU environment for each individual is needed in order to understand and reinforce care of the neonates in cycled light. Finally, there is need for mentorship to all newly deployed staff and students in clinical rotation to understand the benefits of cycled light to neonates, staff and the mothers.

Challenges Encountered

Despite the project being successful the following challenges were encountered in maintaining the cycled light in the new born unit at the Moi Teaching and referral Hospital; the newborn unit had shortage of resuscitaires necessitating exposure to bright light to all neonates during a procedure of one neonate. Secondly, the newborn unit had no mobile or bedside task light for procedures to be used for individual neonates.

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