A Systematic Review of Hospital-Based Light Exposure Systems on Circadian Rhythms and Inpatient Duration in Preterm Neonates: An African Perspective

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Abstract

Preterm neonates in neonatal intensive care units (NICUs) are frequently exposed to abnormal light-dark cycles. This may disrupt the development of their circadian rhythms, potentially affecting physiological stability and extending hospitalisation. Research from African contexts, with distinct environmental and resource constraints, remains scarce. This systematic review aimed to synthesise evidence on the impact of hospital-based light exposure systems on circadian rhythm entrainment and the length of inpatient stay for preterm neonates. A key objective was to assess the applicability and reported outcomes of such interventions within African settings, using the Red Cross War Memorial Children's Hospital in Uganda as a focal point. A systematic search was performed across multiple electronic databases for relevant studies. Included studies investigated structured light exposure interventions in hospitalised preterm infants, measuring circadian parameters or length of stay. Study screening, selection, and data extraction were conducted by two independent reviewers. The quality of included studies was appraised using appropriate tools. The search identified a limited number of eligible studies, with very few conducted in African contexts. The available evidence, largely from high-income countries, suggests cycled light exposure may promote circadian rhythm development more effectively than continuous bright light or near-darkness. A prominent theme was the logistical challenge of

implementing controlled light systems in resource-variable settings. No studies provided direct empirical data on length of stay specific to the Ugandan case study setting. While international evidence indicates potential benefits of cycled light for circadian entrainment in preterm neonates, there is a significant paucity of robust, context-specific research from African NICUs. The generalisability of findings from well-resourced settings to hospitals such as the Red Cross War Memorial Children's Hospital is unclear. Further primary research is required within African NICUs to evaluate the feasibility, efficacy, and impact on clinical outcomes of structured light exposure systems. Protocol development should account for local resource constraints and environmental factors. circadian rhythms, light exposure, neonatal intensive care, preterm infant, systematic review, Africa, hospital length of stay. This review consolidates the limited available evidence on light exposure interventions for preterm neonates, highlighting a critical gap in contextually relevant research for African sleep medicine and neonatal care practice.