Nighttime Sleep Disruptions, the Hospital Care Environment, and Symptoms in Elementary School-Age Children With Cancer

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Purpose/Objectives: To describe nighttime sleep-wake patterns during a 12-hour night shift among school-age children with cancer receiving inpatient chemotherapy and relationships among nighttime sleep, environmental stimuli, medication doses, and symptoms during that shift.

Design: Exploratory, descriptive, multiple-case study.

Setting: Inpatient pediatric oncology unit at a tertiary pediatric hospital in the western United States.

Sample: 15 elementary school-age children with cancer receiving inpatient chemotherapy.

Methods: Wrist actigraphs measured sleep-wake patterns. Data loggers and sound pressure level meters measured bedside light, temperature, and sound levels. Medication doses and occurrences of pain, nausea, and vomiting were identified through chart review.

Main Research Variables: Minutes of sleep.

Findings: Sleep varied based on time of night ($F = 56.27$, $p < 0.01$), with sleep onset delayed past 10 pm. A basic mixed linear model identified significant fixed effects for sound ($F = 50.87$, $p < 0.01$) and light ($F = 7.04$, $p < 0.01$) on minutes of sleep. A backward regression model including sound, light, medication doses, pain, and nausea accounted for about 57% of the variance in sleep minutes ($F = 62.85$, $p < 0.01$).

Conclusions: Sleep was marked by frequent awakenings, limiting children's ability to experience full sleep cycles. Multiple factors—in particular, excessive sound levels—compromise sleep quantity and quality throughout the night.

Implications for Nursing: Efforts to develop and test individualized and system-based interventions to modify the hospital care environment to promote nighttime sleep are needed. Oncology nurses have the opportunity to influence the care environment at an individual level and to influence unit-based practices to promote a healthy nighttime sleep environment.

Attention to symptom management is an important aspect of quality of life for children undergoing treatment for cancer (Hinds et al., 2004). Disturbed sleep is among the most frequently named symptoms and is reported by 30%–45% of children and adolescents with cancer (Baggott et al., 2010; Bhatia et al., 2004; Collins et al., 2000, 2002; Walker, Gedaly-Duff, Miaskowski, & Nail, 2010). Children and adolescents receiving chemotherapy report that sleep disturbances persist across treatment modalities (Baggott et al., 2010; Walker et al., 2010). Disturbed sleep patterns may persist following treatment and are associated with poorer neurocognitive outcomes among childhood cancer survivors (Clanton et al., 2011).

Sleep and Hospitalized Children

Sleep is a complex, regulated bioenvironmental process essential for health and well-being. School-age children require 10–11 hours of nighttime sleep and awaken briefly 4–6 times each night at the completion of a typical 90–110 minute sleep cycle (Mindell & Owens, 2010; Sheldon, 2005). Consequences of disruption and deprivation of nighttime sleep are particularly concerning for children with cancer. Disrupted nighttime sleep alters normal hormonal regulation related to immune function, as well as natural killer cell activity and cytokine activity (Irwin et al., 1996, 2006; Van Cauter & Spiegel, 1999). Insufficient sleep is associated with poorer daytime functioning, cognitive impairment, mood and behavioral problems, and increased risk-taking behaviors (Mindell & Owens, 2010).

Hospital environmental stimuli, particularly sound and light levels and caregiver activities, are negatively correlated with sleep quantity and quality among children in pediatric intensive care units (PICU) (Al-Samsam & Cullen, 2005; Carno, Hoffman, Henker, Carcillo, & Sanders, 2004; Corser, 1996; Cureton-Lane & Fontaine, 1997). Nighttime sleep is reduced and fragmented relative to age-related norms, and PICU nighttime sound levels consistently exceed 50 decibels (dB), with spikes to 103 dB (Carvalho, Pedreira,