SLEEP PATTERN AND SLEEP DISTURBANCE FACTORS OF 1 TO 2 YEAR OLD ILL CHILDREN IN THE GENERAL PEDIATRIC UNIT

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The purpose of this descriptive study was to describe the relationship of sleep pattern and sleep disturbance factors of 1 to 2 year old ill children. Purposive sampling of 20 patients were recruited from 1 to 2 year old ill children in the general pediatric unit of Ban Pong Hospital. Research instruments were 93408 Digital Lux Meter, GA 123 Sound Exposure, Bannan thermometer and a clock. Sleep-wake behavior recording criteria was modified from Anderson Behavioral State Scale (Gill et. al., 1988). The caregiving activities recording criteria was modified from Zahr's Nursing Activity Observation Tool (1998). Sleep-wake behaviors, light, noise, environmental temperature and caregiving activities were observed and recorded every 5 minutes throughout a 24-hour period.

The results of this study revealed that light, noise and caregiving activities were statistically significant with a moderate negative correlation with nighttime sleep ($r = -.684$, $p < .01$, $r = -.548$, $p < .05$, and $r = -.571$, $p < .01$, respectively) and nighttime sleep interval ($r = -.700$, $-.677$, and $-.621$, respectively, all $p < .01$) and moderate positive correlation with night-waking ($r = .564$, $p < .05$, $r = .628$, $p < .01$, and $r = .625$, $p < .05$, respectively). Environmental temperature was statistically significant with a moderate negative correlation with daytime sleep ($r = -.506$, $p < .05$). Noise, environmental temperature and caregiving activities were statistically significant with a moderate negative correlation with total sleep time ($r = -.591$, $p < .05$, $r = -.480$, $p < .05$, and $r = -.601$, $p < .01$, respectively). The findings indicated that light, noise, environmental temperature, and caregiving activities affected the sleep pattern of ill children. Thus nurses should be concerned and appropriately manage sleep disturbance factors and promote sleep and more silence.

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รัตติกาล งามเปี่ยม : แบบแผนการนอนหลับและสิ่งรบกวนการนอนหลับของเด็กป่วยอายุ 1-2 ปี ที่รับการรักษาในหอผู้ป่วยกุมารเวชกรรม (SLEEP PATTERN AND SLEEP DISTURBANCE FACTORS OF 1 TO 2 YEAR OLD ILL CHILDREN IN THE GENERAL PEDIATRIC UNIT). คณะกรรมการควบคุมวิทยานิพนธ์: ยุวดี ฦาชา, Ed.D., เรณู พุกบุญมี, D.N.S. , 73 หน้า ISBN 974-04-2646-8

การวิจัยครั้งนี้เป็นการวิจัยเชิงบรรยายโดยมีวัตถุประสงค์เพื่อศึกษาความสัมพันธ์ระหว่างสิ่งรบกวนการนอนหลับและแบบแผนการนอนหลับของเด็กป่วยอายุ 1-2 ปี การเลือกกลุ่มตัวอย่างเป็นการเลือกแบบเฉพาะเจาะจงตามเกณฑ์ที่กำหนด ซึ่งเป็นเด็กป่วยอายุ 1-2 ปี ที่รับการรักษาในหอผู้ป่วยกุมารเวชกรรม โรงพยาบาลบ้านโป่งจำนวน 20 คน เครื่องมือในการดำเนินการวิจัย คือ เครื่องวัดแสงยี่ห้อ 93408 ดิจิตอล ลักซ์ มิเตอร์ เครื่องวัดเสียงยี่ห้อจีเอ 123 ซาวน์ เอ็กซโพสเชอร์ เครื่องวัดอุณหภูมิยี่ห้อแบนแนน และนาฬิกา การหลับ-ตื่นสังเกตได้จากพฤติกรรมการหลับ-ตื่น ซึ่งแปลและดัดแปลงมาจากแบบประเมินพฤติกรรมการหลับตื่นของแอนเดอร์สันโดยกิลล์และคณะในปี ค.ศ. 1988 ส่วนกิจกรรมการดูแลได้แปลและดัดแปลงมาจากกิจกรรมการพยาบาลของซาห์ในปี ค.ศ. 1998และได้ทำการสังเกตและบันทึกพฤติกรรมการหลับ-ตื่น แสง เสียง อุณหภูมิสิ่งแวดล้อม และ กิจกรรมการดูแล ทุก 5 นาทีตลอด 24 ชั่วโมง

ผลการวิจัยพบว่า แสง เสียง และกิจกรรมการดูแลมีความสัมพันธ์เชิงลบระดับปานกลางกับเวลานอนหลับกลางคืนอย่างมีนัยสำคัญทางสถิติ ($r = -.684, p < .01, r = -.548, p < .05$, และ $r = -.571, p < .01$, ตามลำดับ) และระยะเวลานอนหลับที่ต่อเนื่องในแต่ละครั้งตอนกลางคืนอย่างมีนัยสำคัญทางสถิติ ($r = -.700, -.677$ และ $-.621$ ตามลำดับ, p ทั้งหมด $< .01$) และมีความสัมพันธ์เชิงบวกระดับปานกลางกับจำนวนครั้งที่ตื่นเวลากลางคืน อย่างมีนัยสำคัญทางสถิติ ($r = .564, p < .05, r = .628, p < .01$, และ $r = .625, p < .05$ ตามลำดับ) อุณหภูมิสิ่งแวดล้อมมีความสัมพันธ์เชิงลบระดับปานกลางกับเวลานอนหลับกลางวันอย่างมีนัยสำคัญทางสถิติ ($r = -.506, p < .05$) เสียง อุณหภูมิสิ่งแวดล้อม และกิจกรรมการดูแลมีความสัมพันธ์เชิงลบระดับปานกลางกับเวลานอนหลับทั้งวันอย่างมีนัยสำคัญทางสถิติ ($r = -.591, p < .05, r = -.480, p < .05$ และ $r = -.601, p < .01$, ตามลำดับ) ผลการวิจัยแสดงให้เห็นว่า แสง เสียง อุณหภูมิสิ่งแวดล้อม และกิจกรรมการดูแลมีผลกระทบต่อ แบบแผนการนอนหลับของเด็กป่วย ดังนั้นพยาบาลจึงควรให้ความสนใจและจัดการสิ่งรบกวนการนอนหลับให้เหมาะสม รวมทั้งการส่งเสริมการนอนหลับ และความเงียบสงบ

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CHAPTER I

INTRODUCTION

Background and Rationale

Sleep is a basic physiologically requirement for survival, as is eating and toileting (Adair & Bauchner, 1993: 153). Sleep is the best way of physical and mental rest. It is a natural phenomenon and a part of physiological rhythm, which includes sleeping, awakening, and working as a cycle of life. Sleep is a period of diminished responsiveness to external stimuli (Lee, 1997: 614).

A good quality of sleep has important concerns in health and illness. Sleep helps to promote the growth process and physical strength, repairing damaged tissues, restoring energy for system functions in a life span, promoting balance neurological system function, promoting learning process and memory (Nordmark & Rohweder, 1975: 158; Hodgson, 1991: 1506). In addition, it encourages people to cope effectively with crisis situation they face during their illness (Oswald, 1980 cited by Dorociak, 1990: 38; Jensen & Herr, 1993: 385). Sleep is essential for the physical and mental function in everyone. Usually, a human sleeps and wakes up habitually. Adequate sleep for human beings is defined as a person who can maintain the pattern of sleep normally and receive adequate quantity of sleep. Approximately one-third of our life is measured as being an adequate quantity of sleep. Enough sleep will help people to do their activities efficiently during waking periods. (Lee, 1997: 614; Espie, 1994: 137; Craven & Hirnle, 2000: 1118; Brugne, 1994: 68). People have different sleep needs and sleep times depending on many factors. Children need sleep more often than adults, as sleep promotes development for the child's immature brain. It is found that, in deep sleep periods, a human growth hormone will be secreted, that is useful for physical growth (Hodgson, 1991: 1505; Brugne, 1994: 68). Children's sleep patterns change at each developmental age showing the ontogeny of a child's ability in basic functions which its characteristics change significantly as a child matures from a newborn infant to an adult (Adair & Bauchner, 1993: 147). Therefore, people should be interested in and concerned with sleep care, as it is important as other cares. Especially in the nighttime, it is considered the best natural sleeping time for human beings. Sleep is in remarkable harmony with the sleep during the hours of darkness and wakefulness during the daytime (Boorstin, 1987 cited by Brugne, 1994: 68). For the child, adequate sleep at night is an essential precondition for maximal daytime alertness and a responsibility to social interactions and other environmental stimuli and events (Beltramini & Hertzig, 1983: 153). Children who sleep easily and deeply for a long time will play and laugh cheerfully and happily after their awakening and will be healthy both physically and mentally.

On the other hand, if sleep problems occur, which may be assessed by 1) polysomnography 2) patient sleep behavior observation tool or 3) oneself report. The biological system will be affected such as unrelated to system function and alteration in thinking/perception/emotion and speaking. These factors increase both physical and mental stress (Hodgson, 1991: 1508). Furthermore, they hamper recovery from illness (Halm & Alpen, 1993: 452). Sleep deprivation effects behavioral and emotional response. There are many physiological changes being effected from sleep inadequacy, for example; falling of the body temperature, slight change in cardiovascular and respiratory function, arrhymia, tremor, decreasing of reflexes, thinking and decision making delay, and decreasing of seeing and hearing. Psychological effects include irritability, aggressiveness, lack of surrounding attention, confusion, and drowsiness (Hodgson, 1991: 1506-7). It could be seen that the symptoms of sleep problems are caused by a difficult time of falling sleep, broken sleep, earlier awakening and long daytime sleeping or naps.

Sleep is a complex phenomenon effected by one's internal and external environment. Internal factors that may negatively influence sleep include stress, anxiety, depression, pain, and discomfort (Hodgson, 1991: 1507-8). Multiple stimuli in the external environment can exert strong and often negative influences that result in dysfunctional sleep, which includes, noise, light, and nursing activities. These factors decrease quality of sleep. There is an increased need for sleep during illness (Southwell & Wistow, 1995: 1102; Corser, 1985: 24). The sleep of children is structurally different from that of adult. Children need sleep more than adults do. Especially when they are ill, they need more sleep than usual time. The hospital atmosphere is unfamiliar from home such as continuously bright lights, loud noises from medical equipment; care giving activities going on and, stranger and medical equipment. All of these factors increase the child's stress that it makes children experience dysfunctional sleep. Physiological and psychological change associated with sleep disturbance decreases the ability of an ill child to adapt to hospitalization and thus hamper recovery.

According to the researcher's experience, it is often found that ill children have sleep problems such as difficulty in falling asleep, broken sleep, wakefulness during nursing activity, and crying after awakening. The nature of a general pediatric unit and their disease present many stimulus. This may cause an adverse affect to sleep patterns such as unfamiliar environment bright lights, loud noises, disruptive of normal routines, pain and severity of illness. There were several researches studying the effects of sleep disturbance factors, but most of the research demonstrated that hospital settings interfered with sleep of adult patients. Such as Potharos (1995) who studied the quality of sleep and sleep disturbances of postoperative patients. It was shown that quality of postoperative sleep was lower than preoperative and many sleep disturbances were negatively correlated with quality of sleep. Little sleep research has been conducted with children in the hospital setting. Corsor (1996) studied the sleep pattern of 12 children age 13 to 35 months who were admitted to pediatric intensive care unit. Children experienced a significant loss of sleep, frequent awakenings, and virtual rapid eye movement, which caused sleep deprivation. External environmental stimuli of light, noise, and caregiver activity were negatively correlated with sleep stage. Surayudthapreecha (1998) studied phenomena of interest about quality of sleep and sleep disturbance factors of infant and found that the majority of sleep was ineffective both in quantity and quality of sleep. Sleep disturbance factors were noise and caregiving activities.

Most of the children sleep researches are conducted in foreign countries. In Thailand, the researcher could not find any study reporting about sleep patterns. In the general pediatric unit, Ban Pong Hospital, the number of 1 to 2 year-old ill children in years 1998-2001 is 853, 743, 506 and 557 respectively. At this age, sufficient and appropriate sleep is important because the brain cells increase continuously, and brain growth rate is 75% completed by the end of second year of life (Wong, 1999: 665-6). Therefore, to promote and maintain sleep function during hospitalization this could help the ill children to have continuous growth and development and rapidly recovery from the afflicted illness. Thus, the researcher is interested in and would like to study more about the sleep patterns and sleep disturbance factors of this group of children who are admitted to the general ward.

Conceptual Framework of the Study

This study explained the effect of hospital environmental stimuli on ill children's sleep pattern base on function of brain.

The sleep and waking states depend on activity from the entire brain and not from a particular or independent region. In general, neural activity in the brainstem-diencephalic ascending reticular activating system (RAS) is responsible for the maintenance of alertness and the waking state. The RAS consists of a network of interconnecting neurons in the medulla, pons, and midbrain, with projections to the spinal cord, hypothalamus, cerebellum, and cerebral cortex. The reticular formation of the brain stem is admirably constructed to perform the arousal functions. It receives tremendous number of signals either directly or indirectly from the spinoreticular tracts, the spinothalamic tracts. The auditory tracts, the visual tracts, and others, so that almost any sensory stimulus in the body can activate it. In addition to the activation of the RAS by sensory impulse, the cerebral cortex can also stimulate this system. When the RAS is completely rested, the sleep centers are not activated. The wakefulness centers then presumably begin spontaneous activity. This in turn excites both the cerebral cortex and the peripheral nervous system. Next, positive feedback signals, which comes from both areas, goes back to the RAS, which further activates it. Thus, once the wakefulness state begins, it has a natural tendency to sustain itself (Guyton, 1981: 179-182; Sheldon, et al., 1992: 37-44).

During hospitalization, children's sleep pattern could be disrupted by many stimuli. The ill children may be bombarded with loud noise, bright lights, environmental temperatures, and frequently caregiving activities. When the ill children are sleeping, the level of activity of the RAS is greatly decreased; yet, almost any type of sensory signal can immediately activate the system. For instance, hot, cold and tactile sensation or pain impulses from the skin, visual signals from the eyes, auditory signals from the ears can all cause sudden activation of the RAS and therefore arouse the ill children. Then, the ill children are sensible, perceptive, and wakeful. Frequent awakenings of the ill children lead to incomplete sleep cycle that alters their sleep pattern. The normal sleep pattern composes of two distinct stages of sleep occur during a night: rapid eye movement (REM) and non-rapid eye movement (NREM). NREM sleep can be divided into four stages as follows: stage 1 drowsiness, stage 2 light sleep and stage 3 and 4 deep sleep. The quality of sleep could be investigated by using polysomnography. It measures the brain function on REM and each stage of NREM sleep. However, the quantity of sleep could be observed on the child's sleep-wake behavior, which could be calculated into sleep pattern (Charatong, 2001). Thus the ill child's sleep pattern was choose to be studied. Sleep pattern includes nighttime sleep, nighttime sleep interval, night-waking, daytime sleep, and total sleep time. The relationship between sleep disturbance factors and sleep pattern is illustrated in Figure I.

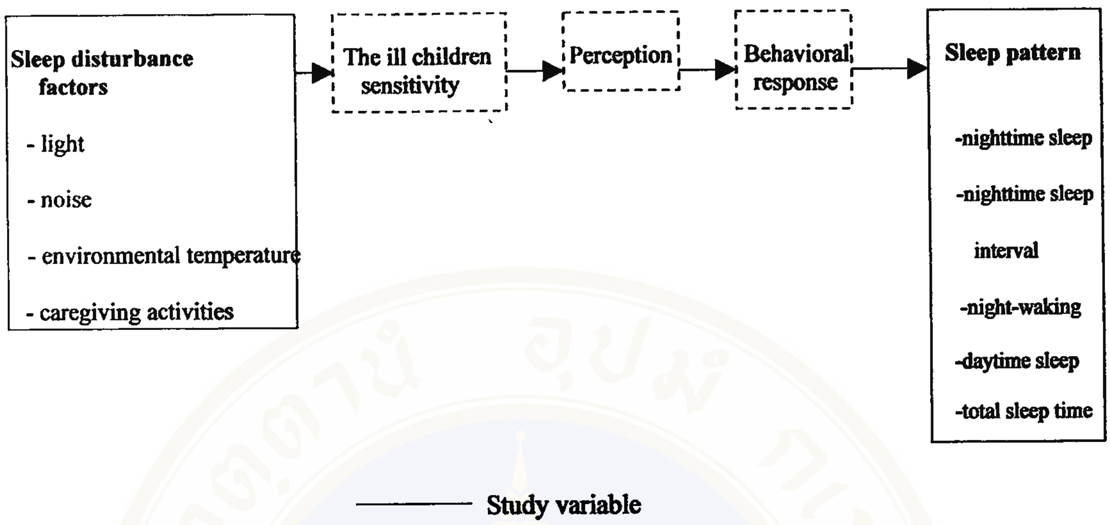

Figure I: The Relationship between Sleep Disturbance Factors and Sleep Pattern

Research Questions

The research questions are:

1. What is the sleep pattern (nighttime sleep, nighttime sleep interval, night-waking, daytime sleep and total sleep time) of 1 to 2 year old ill children in the general pediatric unit?

2. What are the levels of sleep disturbance factors (light, noise, environmental temperature and caregiving activities) of 1 to 2 year old ill children in the general pediatric unit?

3. What are the relationships between sleep disturbance factors and sleep pattern of ill children aged 1 to 2 year old, who are in the general pediatric unit?

Purposes

1. To study the sleep pattern (nighttime sleep, nighttime sleep interval, night-waking, daytime sleep and total sleep time) of 1 to 2 year old ill children in the general pediatric unit.

2. To study the level of sleep disturbance factors (light, noise, environmental temperature and caregiving activities) of 1 to 2 year old ill children in the general pediatric unit.

3. To study the relationships between sleep disturbance factors and sleep pattern of 1 to 2 year old ill children in the general pediatric unit.

Hypothesis

1. Light, noise, environmental temperature and caregiving activities in a 12-hour nighttime are correlated with the nighttime sleep, nighttime sleep interval and night-waking of 1 to 2 year old ill children in the general pediatric unit.

2. Light, noise, environmental temperature and caregiving activities in a 12-hour daytime are correlated with the daytime sleep of 1 to 2-year old ill children in the general pediatric unit.

3. Light, noise, environment temperature and caregiving activities in a 24-hour period are correlated with the total time sleep of 1 to 2-year old ill children in the general pediatric unit.

Scope of the Study

This study observed sleep pattern and sleep disturbance factors (light, noise, environmental temperature, and caregiving activities, and controlled for the internal stimuli and personal factors) of 1 to 2 year old ill children during 24 hours duration in the general pediatric unit, Ban Pong Hospital, during March to May 2002.

Expected Outcomes and Benefits

1. To form fundamental knowledge for studying children sleep problems.
2. To be a guide for assessing the causes of sleep deprivation and finding how to promote ill children to have sleep that is more effective.
3. To be a guide for other researchers about sleep and sleep disturbances as well as resolving sleep problems in other patient groups.

Definition of Terms

Sleep pattern refers to sleep-wake cycle during nighttime and daytime in 24 hours which includes: nighttime sleep, nighttime sleep interval, night-waking, daytime sleep and total sleep time. It was calculated from the sleep-wake behaviors, which were observed every 5 minutes for 24 hours. The sleep-wake behavior was modified from the Anderson Behavioral State Scale (Gill et. al., 1988), then grouped into 2 parts. Sleep behaviors were recorded when the children closed their eyelids, which had an effect of regular slow respiration rate, moving their body and changing position spontaneously. Awaken behaviors were recorded when the children opened or fluttered their eyelids, have access activity, breathing rapidly, shallow or irregular. Some children may cry.

Nighttime sleep refers to a quantity of time sleep during the night in 12 hours, since 7.00 p.m. to 7.00 a.m. Nighttime sleep was measured by observation. Unit of time constitutes a minutes.

Nighttime sleep interval refers to the continuous period of each nighttime sleep. Nighttime sleep interval was measured by observation. Unit of time is in minutes.

Night-waking refers to the frequency of awakening during the night from 7p.m. to 7 a.m. Night-waking was measured by observation. Unit of night-waking is in times.

Daytime sleep refers to a quantity of time of sleep during the day in 12 hours since 7.00 a.m. to 7.00 p.m. Daytime sleep was measured by observation. Unit of time is in minutes.

Total sleep time refers to all of the sleep times in 24 hours, since 7.00 p.m. to 7.00 p.m. in a day that was measured by observation. Unit of time is in minutes.

Sleep disturbance factors refer to external stimuli that effected ill childrens' sleep. As a result, children woke up during their sleep, including: light, noise, environmental temperature, and caregiving activities.

Light refers to the bright light both internal and external in the general pediatric unit. Sources of light such as electricity light and the sun light. Light level was measured by 93408 Digital Lux Meter. Illuminant of light is measured in lux.

Noise refers to loudly noise both internal and external to the general pediatric unit. Sources of noise included medical equipment, nursing activity, talking, walking, opening-closing the door, radio, television, telephone etc. Noise level was measured by GA 123 Sound Exposure Meter. Intensity of noise is measured in decibels (dB).

Environmental temperature refers to the temperature surrounding the general pediatric unit during the period of sleep-awaken behaviors as observed. Bannan thermometer was used in reading the room temperature level in degree Celsius and recorded every 5 minutes along with the study period.

Caregiving activities refers to cargiving activities, which each patient received, from the physician, nurse, a family caregiver, and other health caregiver such as radiologist and physiotherapist. These activities effect the patient by tactile stimuli. The caregiving activity was observed by using the Caregiving Activity Observation Tool, which was modified from Zahr's Nursing Activity Observation Tool (1998) by the researcher. The caregiving activities were divided into three subcategories to obtain: mildly, moderately and highly intrusive caregiving activities.

Mildly intrusive caregiving activities refer to caregiving activities which are not invasive and cause mild amount of pain to the ill children.

Moderately intrusive caregiving activities refer to caregiving activities which are or are not invasive or have already invaded and cause moderate amount of pain to the ill children.

Highly intrusive caregiving activities refer to caregiving activities which are invasive and cause high amount of pain to the ill children.

CHAPTER II

LITERATURE REVIEW

A number of literatures, articles, and topics related to the study were reviewed. Relevant information was grouped under the following three topics:

(1). Nature of sleep

(2). Sleep pattern in children

(3). Sleep disturbance factors and its relation to sleep pattern

Nature of Sleep

Sleep is a natural requirement for all human beings and is important for physical and psychologic health. Sleep is a part of biological cycle, a complex process, and behavioral rhythm level in which sleep and wakefulness are cycles. During sleeping, the body and mind stores and filters energy for activities of daily living for the next day. Sleep has a wide interest both from a science point of view and from a medical science view point. Definition of sleep, and both sleep and wakefulness, stages of sleep and importance of sleep are described in this topic.

Definition of sleep

Sleep is a complex biological rhythm that is intricately related to other biological rhythms and body functions (Hayter, 1980: 457).

Fordham has said that there are two possible ways of defining sleep: first as a discrete state which describes sleep as a state of reduction. Responsiveness to external stimuli, an altered state of consciousness from which a person can be aroused if the stimulus is of sufficient magnitude. The second part describes sleep as the physically inactive part of the circadian (around a day) sleep-wake-active cycle (Fordham, 1988 cited by Hodgson 1991: 1503).

Sleep is complex both from a behavioral and a physiological perspective. In simple terms sleep is a reversible disengagement from and unresponsiveness to the external environment, regularly alternating with engagement and responsiveness in a circadian manner (Sheldon, et al., 1992: 9).

Sleep has been defined as a state of unconsciousness from which a person can be aroused by appropriate sensory or other stimuli (Guyton 1991: 659).

Sleep is not a period of mere physiological quiescence, but a complex phenomenon, which results from numerous different physiological processes (Turpin, 1986: 313).

Sleep is a naturally occurring altered state of consciousness characterized by decreases in awareness and responsiveness to stimuli that is distinguished from abnormal state of consciousness (e.g. coma) by being readily reversible (Craven & Hirnle, 2000: 1118).

Therefore, to summarize, sleep is complex in both a behavioral and a physiological process and intricately related to biological rhythms of life. It is a reversible disengagement from and unresponsiveness to the external environment.

Sleep and wakefulness

Sleep is generated and maintained by many different regions of the central nervous system working together rather than simply by a reduction in activity of the reticular activating system (RAS) (Guyton, 1981: 188; Sheldon et al., 1992: 37).

The sleep and waking states depend on activity from the entire brain and not from a particular or independent region. In general, neural activity in the brainstem-diencephalic ascending reticular activating system is responsible for the maintenance of alertness and the waking state. The RAS consists of a network of interconnecting neurons in the medulla, pons, and midbrain, with projections to the spinal cord, hypothalamus, cerebellum, and cerebral cortex.

Anatomically, the reticular formation of the brain stem is admirably constructed to perform the arousal functions. It receives tremendous number of signals either directly or indirectly from the spinoreticular tracts and the spinothalamic tracts. The auditory tracts, the visual tracts, and others, so that almost any sensory stimulus in the body can activate it. In addition to activation of the RAS by sensory impulse, the cerebral cortex can also stimulate this system. Direct fiber pathways pass into the reticular formation. Because of an exceedingly large number of nerve fibers that pass from the motor regions of the cerebral cortex to the reticular formation, motor activity in particular is associated with a high degree of wakefulness, which partially explains the importance of movement to keep a person awake. However, intense activity of any other part of the cerebrum can also activate the RAS and consequently can cause a high degree of wakefulness (Guyton, 1981: 179-182; Sheldon, et al., 1992: 37-44).

Factors that can cause wakefulness in relation to the RAS (Guyton, 1981: 188; Sheldon et al., 1992: 37-44; Robison, 1993: 501-505).

1. Stimulation of the medial portion of the reticular formation, especially in the mesencephalon and upper pons, will cause intense wakefulness.

2. Widespread stimulation of sensory nerves throughout the body will also cause wakefulness. These nerves transmit strong signals into the mesencephalic portion of the RAS.

3. Stimulation of most areas of the cerebral cortex will also cause a high level of wakefulness. These areas also transmit strong signals into both the mesencephalic and thalamic portions of the RAS.

4. Stimulation in certain regions of the hypothalamus, especially in the lateral regions, can also cause extreme degrees of wakefulness. Here again, strong signals are known to be transmitted into the RAS.

5. The locus ceruleus is especially important in maintaining activity in the RAS. The nerve fibers from this area are distributed widely throughout other portions of the reticular formation and throughout almost all areas of the diencephalon and cerebrum as well. They all secrete norepinephrihe at their endings. It is believed that this norepinephrine in some way plays a role in the wakefulness process. It has been suggested that dopamine and epinephrine, both of which are very similar to norepinephrine, might also contribute to wakefulness because neurons in closely allied regions of the brain stem secrete these transmitter substances and seem to be activated, in many instances, along with the norepinephrine system.

The cycle between sleep and wakefulness

It is quite possible that this is caused by a free running intrinsic oscillator within the brain stem that cycles back and forth between the sleep and wakefulness centers, the wakefulness centers presumably activating the RAS, and the sleep centers inhibiting this system.

When the RAS is completely rested and the sleep centers are not activated, the wakefulness centers then presumably begin spontaneous activity. This in turn excites both the cerebral cortex and the peripheral nervous system. Next, positive feedback signals come from both areas back to the RAS to activate it still further. Thus, once the wakefulness state begins, it has a natural tendency to sustain itself.

However, after the brain remains activated for many hours, even the neurons within the activating system presumably will fatigue. Consequently, the positive feedback cycle between the RAS and cortex, and also that between the RAS and the periphery, will begin to fade. As soon as a few of the neurons in the RAS become inactive, this also eliminates part of the feedback stimulus to the other neurons as well. Therefore, these also become inactive. The process spreading rapidly through the neurons and leading to rapid transition from the wakefulness state to the sleep state.

It can explain arousal. Insomnia that occurs when a person's mind becomes preoccupied with a thought, the wakefulness that is produced by bodily activity, and many other conditions that affect the person's state of sleep or wakefulness. When a person is sleep, the level of activity of the RAS is greatly decreased; yet almost any type of sensory signal can immediately activate the system. For instance, proprioceptive signals from the joints and muscles, pain impulses from the skin, visual signals from the eyes, auditory signals from the ears, or even visceral sensations from the gut can all cause sudden activation of the RAS and therefore arouse the person.

Stage of sleep

Generally, child's sleep stage had been classified in a manner similar to adults. Research associated sleep with polysomnography, which is recorded by the electroencephalogram (EEG), electrooculogram (EOG), and electromyogram (EMG). It has been shown that there are two distinct stages of sleep: non – rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep.

Non-rapid eye movement sleep (NREM sleep)

NREM sleep is what we think of as sleep and after 6 months of age, is typically the first type of sleep entered from awake state. It is divided into four stages based on EEG (Adair & Bauchner, 1993: 148).

Stage 1. Stage 1 is the transitional stage between drowsiness and sleep, indicated by a shift from the alpha waves to low- voltage, fast theta waves on the EEG. Muscles relax, respirations become even, eye rolling, and possibly opening and closing of the eyelids. A person is very easily awakened by sensory stimulation. (Lee, 1997: 616; Craven & Hirnle, 2000: 1118 & Adair; Bauchner, 1993: 148).

Stage 2. Stage 2 is still a relatively light sleep from which the person is easily wakened. Burests of sleep spindles and K complexes appear on the EEG. Rolling eye movements continue, and snoring may occur. (Lee, 1997: 616; Adair & Bauchner, 1993: 148).

Stage 3 and 4. Stage 3 and 4 are deep sleep, they are sometimes called slow-wave sleep or delta sleep after characteristic waves are seen on the EEG. The muscles are relaxed but muscle tone is maintained; respiration is even and blood pressure, pulse temperature, urine formation, and oxygen consumption by muscles decrease. The sleeper appears tranquil and difficult to arouse (Lee, 1997: 614; Craven & Hirnle, 2000: 1118; Adair & Bauchner, 1993: 148; Kartman, 1995: 39).

Rapid eye movement (REM sleep)

REM sleep is a very active state physiologically and mentally, in contrast to NREM sleep. The defining characteristic of REM sleep is rapid jerky binocular eyes movement The REM sleep is noted to twitch, grimace and make short utterances that correlate with recalled dreams when the sleeper is wakened (Adair & Bauchner, 1993: 149). Blood pressure and pulse rate show wide variations and may fluctuate rapidly. Respirations are irregular and oxygen consumption decrease. Thermoregulation is lost (Craven & Hirnle, 2000: 1118-9; Lee, 1977: 616).

Usually, 1 to 2 year-old children still show a cycle length of about 60-90 minutes, which approximately was 7-9 cycles during each nocturnal sleep period. Sleep latency averages about 15 minutes. Unique characteristics of sleep occurring in this age range may signify stabilization and maturation of the sleep state (Sheldon, et al., 1992: 23-24).

Importance of sleep

Sleep is an inevitable part of human existence and a part of the dynamics of quality of life (Sheely, 1996: 109). It is a natural requirement of all human beings and is important for physical and psychologic health (Cureton-Lane & Fontaine, 1997: 56) which humans spend about one-third of one's life sleeping (Brugne, 1994: 68; Craven & Hirnle, 2000: 1118; Lee, 1997: 614). Although the functions of sleep are not understood, it is generally accepted that it is necessary for the maintenance of good health (and that the need for sleep increases with illness) and that an important role in the restoration of physical and psychological energies (Coser, 1996: 19). Theorists and researchers have identified the function of sleep as: exhaustion prevention, recuperation, information processing, and brain reprogramming (Webb, 1971; Frued, 1924/1956; Boynton, 1973; Scott, 1972 cited by White, et al, 1988: 68). Sleep offers the human body a period of no response, a restorative mechanism that serves to regenerate individuals, physiologically and emotionally (White, et al, 1988: 68). During non-REM sleep, particularly during the first 3 hours of sleep or in stage 3 and 4, growth hormone is secreted from the anterior pituitary in an episodic or pulsatile manner (Oswald & Adam, 1983: 23; Gribbin, 1990 cited by Hodgson, 1991: 1505) and corticosteroids increase, both growth hormones and corticosteroids promote protein synthesis process for restoring tissue and other organs (Oswald & Adam, 1983: 22-24). This sleeping stage has a restorative function, with this stage sleep being necessary for basic biological processes such as tissue repair, recovery from fatigue, and growth. The role of REM sleep has been linked with synthetic and restorative function in the brain, mentality and emotion (Kleitmun, 1963; Oswald, 1972; Hartmam, 1960 cited by Carter, 1985:24; Southwell & Wistow, 1995: 1102). The physiological importance of dreams has been linked with memory storage, memory consolidation and learning (Fisbein & Gutwein, 1981; Squir & Davis, 1981 cited by Hodgson, 1991: 1506).

Sleep deprivation leads to increased fatigability, mood changes and decrease pain tolerance (Gerner, Post & Gillin, 1979; Ghumm, 1983 cited by Sheely, 1996: 109), less attention span and learning (Hazinski, 1992: 178) and may be associated with immunosuppression and diminished protein synthesis, which both are important factors in the healing process (Topf & Davis, 1993: 252; Bairnsfather & Richards, 1988: 35). NREM deprivation is less well studied but it appears to result primarily in fatigue, which may impair the immune system, and depress the body's defenses, and making patients vulnerable to disease (Kartman, 1995: 43). REM deprivation leads to irritability, apathy, decreased alertness, and increased sensitivity to pain and stress. Whereas many studies investigating sleep loss has been done with adults, Carskadon et al.'s research supported that children and adolescents react cognitively to sleep loss in the same manner similar to adults (Carskadon, et al., 1981 a/ 1981 b cited by Corser, 1996: 19).

In contrast to the dramatic changes that take place during the first year of life, transformations during this period are more gradual (Sheldon, et al., 1992: 23). Growth and development continue in a steady manner. Most of the physiologic systems are relatively mature by the end of toddler hood. By the end of the first year, all of the brain cells are presented but continue to increase in size. Myelination of the spinal cord is almost completed by 2 years of age, which parallels to the completion of most of the gross motor skills associated with locomotion. Brain growth is 75% completed by the end of 2 years. During 1 to 2 years of age, the cognitive processes develop rapidly and that refer to maturity in the thinking process (Wong, 1999: 665-6). The development, or ontogeny, of a child's ability to sleep follows a fairly predictable course, much like the ontogeny of other basic functions such as eating and toileting. Sleep is also similar to these other two functions because it is essential, largely physiologically driven, socially molded and its characteristic change significantly as a child mature from a newborn infant to an adult (Adair & Bauchner, 1993: 147). The establishment and maintenance of stable patterns of nighttime sleep is of major important to the developing child. Adequate sleep at night is an essential precondition of maximal daytime alertness and responsivity to social interactions and other environmental stimuli and events. Therefore, this age of children need adequate sleep for growing and learning and more need sleep during illness for restoring (Beltramini & Hertzig, 1983: 153).

Sleep Pattern in Children

The 24-hour sleep wake cycle is fundamental to the normal functioning of all human being, though the actual length of time spent, asleep may vary enormously between individuals. Organization of sleep is a reflection of neurological maturation and changes through out the life span. From birth to age 12, infant and children demonstrate increasing ability to consolidate and maintain sleep. Between the age of 13 months and 5 years, sleep patterns stabilize (Corser, 1996: 18-19). The adequate amount of sleep is the results in optimal daytime function and minimal drowsiness (Fuller & Schaller-Ayers, 1990: 458). Children need sleep more than adults do. Finally, the total amount of sleep decreases in the course of the childhood. From an average of 16-17 hours at 1 week of age, it diminishes to just less 14 hours by 1 year and 13 hours by 2 years. Thus, during 1-2 years of age, children require approximately 12-14 hours of sleep each day (including naps). Daytime sleep, the morning nap stops at varied ages but most typically, around the first birthday, the afternoon nap endures until approximately 3 years of age. Most 2 year old children take one afternoon nap of 1-2 hours, which is still common, and until their second birthday, some children require a morning nap (Blum & Carey, 1996: 88 Hazinski, 1992: 101,149). Corsor's study (1996) found that the children (92%) still took a nap during the day. Naps ranged from 40 minutes to $2^1/_2$ hours in length, with a mean duration of 93.64 minutes. The nighttime is considered the best natural sleeping time of human beings.

For children, adequate sleep at night is an essential precondition for maximum daytime alertness and a responsibility to social interactions and other environmental stimuli and events. Children should sleep for 10-12 hours at night. Corsor's study (1996) found that night sleep of children at home was approximately 10 hours. During the second year of life, approximately 20% to 40% of children wake during the night. A community survey of 1158 families showed that 20 % of 1-2 years old children awakened five or more night a week (Richman, 1981). Corsor's study (1996) found that 58% of the children slept through the night, and 42% still woke routinely. Children who still awakened at night did so from three to seven nights a week. The awakenings, which often occur during the night, result in interrupted time for patient to complete sleep cycles and poor quality of sleep.

Whenever illness occurs, sleep is inevitably disrupted. Sleep quality and quantity are known to be poor in the hospital settings. Specifically, sleep recordings performed on hospitalized patients have shown an increase in the number of arousals and decreases in sleep efficiency (Meyer, et al., 1994: 1211). The total amount of sleep may be reduced or the quality of sleep may be diminished (Lee, 1997:614). Little sleep research has been conducted with children in the hospital setting such as Corser (1996) who studied the sleep pattern of 12 children age 13 to 35 months, who were admitted to pediatric care unit. Children experienced a significant loss of sleep, frequent awakenings, and virtual rapid eye movement sleep deprivation. Cureton-Lane and Fontaine's study (1992/1997) found that children slept for a mean total of 4.7 hours during the 10 hour night, interrupted by a mean of 9.8 awakening. The mean length of a sleep episode was only 27.6 minutes. Hagemann (1981 a/ 1981 b cited in Corser, 1996: 19) evaluated the sleep pattern of 37 children age 3 through 8 years, who were admitted to a general pediatric unit. Children demonstrated a sleep loss equivalent to 1/5 to 1/4 of their usual sleep. Delayed sleep onset, frequent disruption during the night and early termination of sleep all contributed to sleep loss.

There have been a number of sleep variable identified which characterize sleep. These variables range from measurements of sleep stage to progress of sleep through the night. The sleep characteristic measures of sleep duration, latency, awakenings, and sleep movement have been used by several other authors (Merica & Gillasol, 1985). In this study, the sleep characteristic measures of nighttime sleep, nighttime sleep interval, night-waking, daytime sleep and total sleep time are used to evaluate sleep patterns. Actually, both quality and quantity are important in assessing a night's sleep, but sleep quality observation is rare accuracy in practicality. However, the researcher assessed a number of awakenings during the night, which also result, to quality of sleep in this study.

Sleep Disturbance Factors and Its Relation to Sleep Pattern

Sleep disturbances persist among young children who are exquisitely sensitive to sensory input (Smith & Browne, 1996: 31). In the hospital setting, the environment has one of the highest activities around the clock and is crowded with equipment and people, including the disease process present many stimuli that can adversely affect sleep. Pain, anxiety, lack of control, separation from parents, unfamiliar environment, and disruption of normal routines can contribute to sleep changes (Dontson, et al., 1986; Slota, 1988 cited by Corser, 1996: 19-20; Fontaine, 1989: 402; Kartman, 1995: 38). Physiologic discomfort, fear, stress, and anxiety are the most frequent internal causes of awakening after sleep onset (Hagemann, 1981 a / 1981 b cited by Corser, 1996: 20; Knapp-Spooner & Yarcheski, 1992: 342). The external stimuli, noise, light, temperature, changes in light-dark cycle, restrains, caregiver activity and medications can also contribute to sleep loss (Avital, et al., 1991: 979; Cureton-Lane & Fontaine, 1992: 287/ 1997: 56; Fontiane, 1989: 402; Topf & Davis, 1993: 525). Of the external stimuli, awakening from noise and caregiving activities interruption are most frequent (Hagemann, 1981 a / 1981 b cited by Corser, 1996: 20). Light, noise, environmental temperature, and caregiving activities are described as follow:

Light, visual stimulation is also excessive because of continuous overhead lights. The lights can create sensory confusion, cause patients to loose day or night orientation, and interrupt sleep (Smith & Browne, 1996: 15; Hirnle & Cravan, 2000: 1125). The existing evidence suggests that both sunlight and artificial sources of light have definite psychophysiological effects on individuals (Kearnes, 1989: 32; Blare & Myers, 1994: 380). The hospital settings must have enough light for nursing interventions, and other proceedings and observing. American Academy of Pediatrics reported enough light for procedure is 100 foot- candle (1080 lux) (Yecco, 1993: 57; Jack, 2000: 16). Although a dose-response curve has not been established, it is generally believed that intensities of greater than about 1,500-2,000 lux are required to significantly influence the human circadian system (Lewy, 1983 cited in Campbell, 1993: 829). Previous research has studied sleep of patient in the hospital and nursing homes and the results show that light in the ward is an environmental effect to poor patient sleep (Cruise et al., 1998; Schnelle et al., 1998; Simpson et al., 1996; Woods, 1972).

Noise, defining what constitutes uncomfortable, annoying or alarming noise is not quite so easy as it depends on much more than its decibel level. Noise is auditory stimulation, that as a source of sensory over load. It can cause irritability, lack of attention (Hodge & Thompson, 1990 cited by Biley, 1994: 110), anger, and confusion and sleep deprivation (Falk & Woods, 1973 cited by Biley, 1994: 110; Topf, 1992: 19). Some people are sensitive to noise, while others are not. The US Environmental Protection Agency has proposed a day-night average sound level of 45 dB in daytime and 35 dB at night in hospitals (US Environmental Protection Agency, 1997: 724). Levels of less than 35 dB were recommended for sleep (US Environmental Protection Agency, 1974 & World Health Organization, 1980 cited by Hilton, 1985: 283). However, noise levels in hospitals often exceed this by a large margin, despite the tolerable sound threshold for sick people being lower than that for those who are well (Lipscomb, 1974 cited by Biley, 1994: 111). Sleep disturbances because of noise contributes to hospital patients' inability to obtain adequate sleep. Patients in large open wards reporting greater sleep disturbances than those in smaller wards or single cubicles (Willson-Barnett, 1978 cited by Carter, 1985: 25). Sources of noise are equipment and alarms, other patients, staff talking and walking, telephone, television, opening-closing the door and noise out side the ward, etc (Dodd, 1980 cited by Carter, 1985: 26; Southwell & Wistow, 1998: 1105).

Numerous researchers found that hospital sound levels are higher than recommended levels. Turner, King and Craddock reported day and night average levels of 50-55 dB and 31.5-42.5 dB, with load sound above 70 dB occurring every 1.5-4 minutes (Turner, et al., 1975 cited by Hilton, 1985: 284). Cureton-Lane and Fontaine's study (1997) found that mean noise level in pediatric intensive care unit was 55.1 dB, with sudden, sharp elevations of up to 90 dB. Soutar and Wilson (1986) performed overnight sound monitoring with a noise-averaging meter in a psychiatric unit, general medical ward, and an acute care unit and found the average sound levels of 49 dB, 68 dB, and 66 dB, respectively. The noise level recorded in busy PICU was measured at 45-85 dB (Baker, 1984). Experimental evidence of a causal relationship between CCU sound levels and sleep has recently provided by Topf as sleep insufficiency, spent less time (in minutes) asleep and in stage rapid eye movement (REM) sleep, spent more time awake and had a long latency (in minutes) to REM sleep (Topf, 1992: 19). Increased wakefulness, greater number of awakenings, increased stage 1 sleep and decreased REM sleep have been described in previous studies (Broughton & Baron, 1978; Hilton, 1976 cited by Bairnsther & Richards, 1988: 35).

Environmental temperature: It has an important influence on sleep. The benefits of cool versus moderate room temperatures are matters of personal preference; however, research has shown that excessive warmth or cold increases restlessness (Rochrs et al., 1994: 435). During REM sleep, the environment temperature has a direct effect on a person's internal temperature because thermoregulation is absent and shivering or sweating cannot occur in response to cold and heat. When the environment is too cold or too hot (that is, not thermoneutral at 29 degree Celsius), REM sleep is decreased (Glotzbach & Heller, 1994). A cool temperature is more conducive to sleep than a warm one (Blum & Carey, 1996: 88). Kendel and Schmidt-Kessen (1973 cited in Closs, 1988: 50) pointed out that unclothed and uncovered subjects awoke from cold at 26 degree Celsius and below. A cool temperature is more conducive to sleep than a warm one. Schmidt-Kessen and Kendel (1973 cited by Webster, 1985: 451) found that sleeping at temperatures higher than 24 degree celcious caused less efficient sleep. Being too cold or too hot exhibited a reduction in REM and soundness period, and marked increased in the number and duration of wakefulness (Closs, 1988: 50; Glozbach & Heller, 1994: 262; Libert et al., 1991: 24).

Caregiving Activities enhances stimulation, which each patient received from physicians, nurses, caregivers, and other health caregivers such as radiologist and physiotherapist, etc. Hilton's study revealed that nursing care itself might disturb sleep (Hilton, 1976 cited by Carter, 1985: 26). Activities such as monitoring vital signs, recording urine output, and promoting oxygenation, are frequent occurs in the night (Edwards & Schuring, 1993 a; Woods, 1972 cited by Redeker, 2000: 34). These activities, which often occur hourly (Meyer, 1994: 1211) result in little uninterrupted time for patients to complete 60 minutes of the sleep cycle and appear to be as disruptive to sleep, as is noise (Freedman, et al., 1999 cited by Redeker, 2000: 34). External environmental stimuli of light, noise and caregiver activity were negatively correlated with sleep stage (Corser, 1996: 17). Cureton-Lane & Fontaine found that noise, light and contact with caregivers were significant predictors of sleep (Cureton-Lane & Fontaine, 1992 / 1997).

In summary, sleep is a basic physiological requirement for survival. It helps to promote the growth process and give physical strength, repairing damaged tissues, restoring energy for system function in life span, promoting balance of neurological system function, promoting learning process and memory and encouraging people to cope effectively with crisis situation they faced during their illness. It is found that children need sleep more than adults do. Especially when they are ill, they need more sleep than usual time. Hospital admission causes disruption of the normal sleep-wake cycle and the functions of sleep should be understood in order to comprehend the adverse effects of this disruption. Exogenous factors contributing to the sleep deprivation include frequent interruptions for caregiving activities, continuous noise, bright lights and ambient temperature, which result in effect on recovery from illness, growth and development.

CHAPTER III

METHODOLOGY

A descriptive design was used in this study. It focuses on the sleep pattern and sleep disturbance factors of 1 to 2 year old ill children who were admitted in the general pediatric unit of Ban Pong Hospital.

Population and Sample

The population sample of this study was both male and female ill children ages 1 to 2 year old who were admitted to the general pediatric unit, Ban Pong Hospital during March 11 - May 23, 2002. Purposive sampling yielded 20 children based on the criteria below. The entire data to be analyzed for each variable was 5,760 observations.

Inclusion criteria

1. Good consciousness.
2. Without a diagnosis of neurological trauma, seizures or status epilepticus or sleep apnea.
3. Not currently receiving neuromuscular blocking agents as part of their medical treatment (e.g. sedative drug or analgesic drug).
4. No history of sleep disorders such as snoring.
5. Have a body temperature less than 38 degree Celsius (by axillary measuring), respiratory rate not more than 40 bpm. or no respiratory distress.

6. Admission within 24 hour.

The sample would be excluded from the study if:

1. There was evidence of increased severity of symptoms or coma such as apnea or respiratory distress during the study.

2. The subject received neuromuscular blocking agent during the study.

3. There was convulsions of the patient during the study.

4. The subject snored during the study.

Setting

This study was conducted in a general pediatric unit of Ban Pong Hospital. Ban Pong Hospital is a seven hundred bed general hospital. It is a government hospital run by the Ministry of Public Health. There are special care services which include: Internal medicine, Pediatric, Obstetric and Gynecology, Surgery and Outpatient Department. In the general pediatric unit, children have medical and surgical problems, with the age range from newborn infant to 14 years old are accepted for admission. The admitted children are taken care of by many of the hospital staff. The care providers in the general pediatric unit include: pediatricians, general physicians, registered nurses, technical nurse, nurse aids and medical and nursing students. Most of the activities on the general pediatric unit occurred during the hours of 5.00 a.m.-7.00 p.m. The general pediatric unit visiting time is 12.00-8.00p.m. from Monday – Friday. On holidays, the visiting hours are from 11.00a.m. - 8.00p.m.. One or two of the caregivers will be allowed to stay with the ill children around the clock. The structure of this unit: both front and back of unit have slatted windows. The nursing station is in the front, the shading and two doors are at the back, but it is exposed to the sunlight facing both in the morning and in the afternoon. Thus, the patient' s beds which are at the back of ward, get exposed to the sunlight. The patients' beds are angled in the room, exposed to light less than other beds. This unit has no air-conditioned rooms and not enough electric fans for each patient. In addition, the motorcycle-park is near the general pediatric unit.

Instrumentation

Instrumentation is composed of two types in this study as follows:

1. Research instruments

1.1 93408 Digital Lux Meter: The instrument that is used to measure the lighting levels. The operation is digital, and its range of light level that it can measure- is 0-200,000 lux. One Digital Lux Meter was proved for accuracy by the Accuracy Calibration directly from the company, and used along with the study.

1.2 GA 123 Sound Exposure Meter: The instrument was used to measure sound. It is operated in digital system also. Its range of noise level can measure 30 to 135 dB. One GA 123 Sound Exposure Meter was proved for accuracy by the Castle GA602 and used along with the study.

1.3 Bannan thermometer was used for measuring temperature in the general pediatric unit. The Bannan thermometer is reassured for accuracy of temperature reading from the productive company. The thermometer was checked for reliability measurement by using the other thermometer. This thermometer gives the same temperature readout as the other one.

1.4 A clock was used for time recording during sleep and awaking periods of the sample. One clock was reassumed for accurate time measured by comparing with the standard time. It was used throughout the study.

2. Data collection instruments

Instrumentation for data collection composed of two parts.(see appendix A) They are as follows:

Part I: The demographic data recording form, which included age, sex, and medical diagnosis.

Part II: Sleep- wake recording form. It was designed for recording sleep–wake behavior and sleep disturbance factors including light, noise, environmental temperature, and caregiving activity. It was designed by the researcher.

Sleep-wake was recorded following the criteria used in Sleep-wake Behavior, which was modified from Anderson Behavioral state scale (Gill et al., 1988) by the researcher. The sleep-wake behaviors were divided into two parts, sleep behaviors were recorded when the children closed their eyes, and have regular slow respiration rates, also when they moved their body and changed positions spontaneously. Wake behaviors were recorded when the children opened or fluttered there eyelids, have access activity, breath rapidly or had shallow or irregular breathing. Some children may cry.

Caregiving activities were recorded to follow the criteria used in Caregiving Activity Observation , which was modified from the Zahr's Nursing Activity Observation Tool (1998) by the researcher. Caregiving activities were divided into three subcategories. The activity scores ranged from 0-3; which the score of 0 represented no activity and the score of 3 represented highly intrusive caregiving activities. An increase in score means increasing intrusive caregiving activities. These criteria for level of activities and the activity scores were:

Mildly intrusive caregiving activities such as: the body cleaning (bathing, tepid sponge, etc.), the diaper, trousers or clothes changing, the bed sheets for changing, touching, stroking and kissing during sleeping, the taking and applying of medication, oral feeding, positioning, pulse or axillary temperature measuring and physician examination by auscultation (lung or heart auscultation). The activity scores were 1.

Moderately intrusive activities such as: chest therapies, aerosal therapy, installation of intravenous medicine, dry dressing, cleaning the eyes, mouth or nose, blood pressure or rectal temperature measuring, throat and ear examination or physician examination by palpation or percussion, shaving, removal of tape and feeding tube irrigating. The activity scores were 2.

Highly intrusive activities such as: suctioning, needle insertion through the skin, stitching off, wet dressing, body and intravenous catheter or tube insertion (i.e.feeding tube, chest tube and urinary catheter insertion). The activity scores were 3.

Validity and Interobserver reliability

The content validity of the Sleep-awaken Behavior and the Caregiving Activity Observation Tool had been revised many times. The researcher modified the latest revision appropriately for young children. Then, five experts (see Appendix B) checked for content validity using the Caregiving Activity Observation Tool and Sleep-awaken Behavior. Thus, the instrument was improved by incorporating suggestions from these experts.

The interobserver reliability was assured by the percent agreement between the researcher and two research assistants on data recorded from the 24-hours observation on one child. The data that needed to be checked for the reliability were sleep-wake behavior data and caregiving activities data. By using a formula suggested by Polit & Hungler (1995), the interobserver reliability of caregiving activities between researcher and both research assistants was 100% and sleep-wake behaviors between researcher and the first research assistant and the second one were 97% and 98%, respectively.

Protection of Human Subjects

All eligible subjects were approached to participate in this study. The researcher explained the study objectives, and the data collection processes, benefits of this study, and finally the subjects' right to participate or not in the study to subjects' parents. If they refused it would not affect any treatment they should receive as usual. The parents who agreed to participate signed a consent agreement and were assured that the data would be kept confidential and reported only as confidential as a group (see Appendix C).

Research Assistant Training

Two research assistants were informed and trained before the study began. They would be informed about the study objectives, sample inclusion criteria, and the data collection processes. The concept of sleep-wake behaviors and caregiving activities was discussed until both of them had a clear understanding about the concepts and behaviors that would be used in this study. Training for sleep-wake behaviors and caregiving activities was recorded, and the observation sheet was performed. After this, the researcher and the two research assistants observed the sleep-wake behavior and caregiving activities from the same child for the duration of 24 hours, together. Caregiving activities, not less than 100%, and sleep-wake behaviors, more than 90% of the agreement on data observation was accepted which was a success for the training.

Data Collection

Following the Faculty of Graduate Studies, Mahidol University, and institutional approval and contacted the director of Ban Pong Hospital and head nurse of a general pediatric unit. Data collection procedures were conducted in the following sequence:

1. Researcher or assistants searched for the ill children's name from patient admission records. Identifying the sample according to inclusion criteria.

2. After introducing herself, the researcher worked to build a relationship with the parents and or caregivers. The researcher asked their permission to collect data and protect the rights of the individuals who volunteered as a research subject. Each caregiver would be asked to sign the consent from, which included explanation about the study objectives, the data collection processes and the subjects' right to participate in this study.

3. Either the researcher or the assistant recorded the demographic data from the patient admission record.

4. A 24-hour observation period started at 4 p.m. and ended at 4 p.m. on the next day. The observation period would be divide into three cycles to alternate the

observer for the reason of preventing the observer get fatigued due to intense data collection. The day cycle started from 8 a.m. to 4 p.m., and the afternoon cycle started from 4 p.m. to 12 p.m., and the night cycle started from 12 p.m. to 8 a.m. The GA 123 Sound Exposure meter and the 93408 Digital lux meter were put on the head of the bed approximately at the level of the ears and eyes of the ill child and switched on and the Bannan thermometer was put near the ill child. The data, which was observed included light, noise, environmental temperature, caregiving activities, and sleep-awakening behaviors. The recording interval was set for every 5 minutes. The researcher or one research assistant was the only observer at that time.

6. When the observation finished, the researcher completed the data checking to make sure the completeness and correctness of the data for sturdy analysis.

Data Analysis

The analysis of the data collected was computerized by the Statistical Package.

1. Frequency distribution, percentage, mean, standard deviation, and range were used to describe the demographic data.

2. Mean, standard deviation, and range were used to analyze sleep patterns, light, noise and environment temperature fluctuations.

3. Frequency distribution and percentages are used to analyze caregiving activities.

4. Pearson Product Moment Correlation Coefficient is used to identify the relationships between light, noise, environmental temperature, and caregiving activities and sleep pattern of 1 to 2 year old ill children.

CHAPTER IV

RESULTS

This study was a descriptive research to observe the sleep pattern and sleep disturbance factors of 1 to 2 year old ill children. In this chapter, the results of the data analysis are presented in three parts as follow:

1. Demographic data
2. The sleep pattern
3. The sleep disturbance factors
   3.1 Environmental stimuli
   3.2 Caregiving activities
4. Testing the hypothesis

1. Demographic data

The total samples of this study were 20 participants who were ill and have been admitted at the general pediatric unit of Ban Pong Hospital. The data was collected from March 11 to May 23, 2002.

The demographic characteristics of the sample are shown in Table 1. Their age ranged from 12 to 23 months. The mean age and standard deviation were 17 and 3.83 months, respectively. Gender distribution was males (13 cases) more than females (7 cases). Most of the children were admitted to the general pediatric unit with gastro-intestinal tract problems and respiratory tract problems which were equal to 9 (45%) cases.

Table 1. Numbers, percentage, Range, mean, and standard deviation of the children's characteristics (n= 20 cases)

Characteristics	Number	Percent
Age (month)		
12-14	7	35
15-17	3	15
18-20	5	25
21-23	5	25
range = 12-23, mean = 17, S.D. = 3.83		
Sex		
Male	13	65
Female	7	35
Diagnosis		
Gastro-intestinal tract problems	9	45
Respiratory tract problems	9	45
Abscess	1	5
Apthus ulcer	1	5

2. The sleep pattern

The sleep patterns of ill children included: nighttime sleep, nighttime sleep interval night-waking, daytime sleep, and the total sleep. Its average time for each component of sleep pattern is summarized in Table 2. During a 12- hour nighttime, the mean nighttime sleep was 469 minutes (7.82 hours); standard deviation was 63.88 minutes (1.06 hours). The average nighttime sleep interval was 64.58 minutes (1.08 hours); standard deviation was 21.37 (0.36 hour). The ill children awoke after the onset of sleep a mean of 7.95 times, with a standard deviation of 2.26 times. The mean daytime sleep was 147.75 minutes (2.46 hours), with a standard deviation of 73.28 minutes (1.22 hours) in the 12-hour daytime. The mean total sleep time for ill children was 616.75 minutes (10.28 hours), with a standard deviation of 83.62 minutes (1.39 hours) in a 24- hour period, respectively.

Table 2. Range, mean, and standard deviation of sleep pattern

Sleep pattern	n	Range	Mean	S.D.
Nighttime sleep (min)	20	330-600	469.00	63.88
Nighttime sleep interval (min)	20	5-180	64.58	21.37
Night – waking (times)	20	4-12	7.95	2.26
Daytime sleep (min)	20	0-275	147.75	73.28
Total sleep time (min)	20	425-740	616.75	83.62

3. The sleep disturbance factors

3.1 Environmental stimuli

The average light level in daytime was 328.71 lux, much higher than those in nighttime, which was 86.44 lux. The average noise level and environmental level was almost at the same level among daytime, nighttime and the 24-hour period. The details are presented in Table 3.

Table 3. Range, mean, and standard deviation of light, noise, and environmental temperature (n=20 cases; 5,760 observations)

Sleep disturbance factors	n (observations)	Range	Mean	S.D.
Light (lux)				
12-hour daytime	2,880	6-2000	328.77	219.62
12-hour nighttime	2,880	1-602	86.44	37.64
24-hour period	5,760	1-2000	207.60	118.89
Noise (dB)				
12-hour daytime	2,880	50.4-89.2	62.36	2.03
12-hour nighttime	2,880	45.5-87.6	58.48	1.57
24-hour period	5,760	45.5-89.2	60.42	1.45
Environment temperature (degree Celsius)				
12-hour daytime	2,880	27-37.0	32.18	1.11
12-hour nighttime	2,880	27-33.5	29.46	0.99
24-hour period	5,760	27-37	30.82	0.93

3.2 Caregiving activities

In most of the 5,760 times observations, there was no activity with the ill children (77.45%). The activities which are highly, moderately, and mildly intrusive as performed during the daytime more than nighttime (0.31%, 3.86% and 22.29%, respectively). The data was shown in Table 4.

Table 4. Number and percentage of caregiving activities (n=20 cases; 5,760 observations)

Caregiving activities	12-hrs daytime		12-hrs nighttime		24-hrs	
	No.	%	No.	%	No.	%
No activity	2118	73.54	2343	81.35	4461	77.45
Mildly intrusive	642	22.29	444	15.42	1086	18.85
Moderately intrusive	111	3.86	92	3.19	203	3.53
Highly intrusive	9	0.31	1	0.04	10	0.17
Total	2880	100.00	2880	100.00	5760	100.00

4. Testing Hypothesis

Hypothesis 1: Light, noise, environmental temperature, and caregiving activities in a 12-hour nighttime were correlated with nighttime sleep, nighttime sleep interval, and night-waking of 1 to 2 year old ill children in the general pediatric unit.

The result of Pearson's product moment correlation revealed that light was statistically significant with a moderate negative correlation with nighttime sleep and the nighttime sleep interval (r = -.648 and r = -.700, p< .01 respectively). Noise was statistically significant with a moderate negative correlation with the nighttime sleep and the nighttime sleep interval (r = -.548, p< .05 and r = -.677, p< .01 respectively). Caregiving activities were statistically significant with a moderate negative correlation with nighttime sleep and the nighttime sleep interval (r = -.571 and r = -.621, p< .01 respectively). Light, noise and caregiving activities were statistically significant with a moderate positive correlation with the night-waking (r = .564, p< .05, r = .628, p< .01 and r = .625, p< .01, respectively). However, the environmental temperature was not statistically significant correlated with nighttime sleep, nighttime sleep interval, and night-waking (r = -.097, -.074, and .115, respectively, p> .05). The results are shown in Table 5.

Hypothesis 2: Light, noise, environmental temperature, and caregiving activities in a 12-hour daytime were correlated with daytime sleep of 1 to 2 year old ill children in the general pediatric unit.

The result of Pearson's product moment correlation revealed that only environmental temperature was statistical significant with a moderate negative correlation with the daytime sleep (r = -.506, p < .05). But light, noise, and caregiving activities were not statistically significant correlated with daytime sleep (r = -.039, -.227, and -.420, respectively, p> .05). The details are shown in Table 5.

Hypothesis 3: Light, noise, environmental temperature, and caregiving activities in a 24-hour period are negatively correlated with total sleep time of 1 to 2 year old ill children in the general pediatric unit.

The result of Pearson's product moment correlation revealed that (as shown in Table 5) noise, environmental temperature and caregiving activities were statistically significant with a moderate negative correlation with the total sleep time ($r = -.591$, $p < .01$, $r = -.480$, $p < .05$ and $r = -.601$, $p < .01$ respectively). However, light was not statistically significant correlated with total sleep time ($r = -.417$, $p > .05$).

Table 5. Correlation coefficient between sleep disturbance factors with nighttime sleep, nighttime sleep interval, night-waking, daytime sleep, and total sleep time (n=20 cases).

Sleep Disturbance Factors	12-hour nighttime (2,880observations)			12-hour daytime (2,880 observations)	24-hour period (5,760 observations)
	Nighttime sleep	Nighttime sleep interval	Night-waking	Daytime sleep	Total sleep time
Light	-.648**	-.700**	.564*	-.039	-.417
Noise	-.548*	-.677**	.628**	-.227	-.591**
Environmental temperature	-.097	-.074	.115	-.506*	-.480*
Caregiving activities	-.571**	-.621**	.625**	-.420	-.601**

*p <.05, **p <.01

CHAPTER V

DISCUSSION

In this part, the findings are discussed in the following sequence: sleep pattern, sleep disturbance factors (light, noise, environmental temperature and caregiving activities) and the relationships between sleep disturbance factors and sleep pattern of 1 to 2 year old ill children.

The Sleep Pattern

The findings of the sleep pattern of 1 to 2 year old ill children in general pediatric unit (Table 2) revealed that the ill children spent a total sleep time which was approximately 10-hours of sleep in a 24-hour period. Nighttime sleep was approximately 7.8 hours, and nighttime sleep interval was 64 minutes and night-waking sleep approximately 8 times in 12-hours. The night period and daytime sleep lasted approximately 2.5 hours in a 12- hour day period. The results suggest that the patients had less nighttime sleep and the total sleep time in comparing with recommendations, which was 10-12 hours and 12-14 hours, respectively (Blum & Carey, 1996: 88; Hazinski, 1992: 101,149). Moreover, there were short night sleep intervals and a greater number of awakenings. In addition, the ill children had normal or increased daytime sleep, which is the result of increased napping during the day. It is possible that this increase in duration of sleep is associated with a physical need for sleep. Sleep quality and quantity are known to be poor in the hospital setting. Sleep is inevitably disrupted. Specifically, sleep recording being performed on hospitalized patients have shown an increase in the number of arousals and decreases in sleep efficiency (Meyer et al., 1994: 1211). Corser (1996) who studied the sleep pattern of 12 children age 13 to 35 months which were admitted to the pediatric care unit. His findings showed the same amount of sleep time, awakenings, and sleep periods during the 12-hour nighttime for children, which were 435.83 minutes, 9.03 times, and 52.01 minutes overall, respectively. The total amount of sleep may be reduced or the quality of sleep may be diminished (Lee, 1997:614). Similarly, Cureton-Lane and Fontaine's study found that children slept for a mean total of 4.7 hours during the 10 hour night, interrupted by a mean of 9.8 awakening. The mean length of a sleep episode was only 27.6 minutes (Cureton-Lane & Fontaine, 1992/1997). Hagemann (1981 a/ 1981 b cited in Corser, 1996: 19) evaluated the sleep pattern of 37 children from age 3 through 8 years of age admitted to a general pediatric unit. Children demonstrated a sleep loss equivalent to 1/5 to 1/4 of their usual sleep.

The Sleep Disturbance Factors

The results of this study highlights several important characteristics of the environments present in the hospital setting as follows:

The light levels showed normal rhythmicity with peak levels occurring during the daylight hours and low levels occurring at night, same as Mayer, et al.'s study (Mayer, et al., 1994). The nocturnal peak levels of light equal 602 lux in the general pediatric unit, were well below 1,000 lux. The lowest levels of light was only 1 lux on some nights because the light was turned off or the patients were not exposed due to light direction. The daytime peak levels raised up to 2,000 lux but it was found in only one observation. Light level in this study indicated lesser than recommendations of the American Academy of Pediatric was reported enough light for procedure as 100 foot-candle (1080 lux) (Yecco, 1993: 57; Jack, 2000: 16). Considerable variability was seen in the absolute level and timing of peak exposure within the general pediatric unit, mainly related to window direction, shading, patient's bed position and weather variation, which was during the summer to the rainy season. It has intense bursts of sunlight or dark sky in some day during the data collection period. Lighting levels variation are influenced by seasonal factors (Field et al., 1993; Glotzbach et al., 1993 cited in Fielder & Moseley, 2000: 291). The general pediatric unit remained bright even during the night. Because the light was turned on during the nursing care, the patient's bed position was near the other patient that was getting treated with phototherapy. The light meter was placed on the head of bed that it was below the overhead lighting, and there was also bright light from the out side.

The issue of the hospital noise received high attention in the medical literature. In this study, the finding showed a day-night modulation in noise level. The day peak and lowest noise level were 89.2 and 50.4 dB, respectively, and the night peak and lowest noise level were 87.6 and 45.5 dB, respectively. The mean noise level at the day and the night were 62.36 and 58.48 dB. Sources of noise in this ward include other patients, staff talking and walking, child' s cry, telephone, television, opening-closing the door and noise from out side the ward. The mean noise level in general pediatric unit, therefore, represent levels that are louder than the recommendations by the Environment Protection Agency (US Environment Protection Agency, 1997). They recommended that noise levels in the hospital should not exceed 45 dB in the day and 35 dB at night. In addition, they are higher than these previously described.

Several studies have shown the presence of noise consistently higher levels in various hospital settings. Turner, King and Craddock (1975 cited by Hilton, 1985: 284) reported day and night average levels of 50-55 dB and 31.5-42.5 dB, respectively, with loud sound above 70 dB occurring every 1.5-4 minutes. Cureton-Lane and Fontaine's study (1997: 56) found that mean noise level in pediatric intensive care unit was 55.1 dB, with sudden, sharp elevations of up to 90 dB. Soutar and Wilson (1986) performed overnight sound monitoring with a noise-averaging meter in a psychiatric unit, general medical ward, and an acute care unit and found the average sound levels of 49 dB, 68 dB, and 66 dB, respectively. The noise level recorded in busy PICU was measured at 45-85 dB (Baker, 1984), significantly in excess of the 35 dB considered necessary for adequate rest (Slota, 1988). Some differences in noises appear to be related to design of hospital units, with higher noise levels recorded in areas with more patients (Mayer, et al., 1994; Southwell & Wistow, 1995; Yinnon et al., 1992).

The reasons for the higher noise levels in this institution are hard to describe. The sound level meter itself was placed near the ill child. It is possible that direct disruptions of the crying himself or herself could result in artificially high dB level. The level of noise was recorded in a 5 minutes interval, and it had rapid variations, therefore, the highest and lowest levels of noise might have been missed to been recorded at a time.

The general pediatric unit where this research was conducted had no air-condition and not enough electric fans for each patient. In addition, the weather was varied during the data collection period. Thus, the temperature of the ward was unstable. Mostly, it was hot during the daytime and early in the evening: whereas, it is rather cold during the nighttime and in the early morning. The lowest and highest temperature was 27 and 37 degree Celsius. The highest temperature occurred during the daytime, which was very hot, mainly relating which way the sunlight was facing and the lowest temperature mostly occurred at night.

In the general pediatric unit, the caregiving activities were most of mildly intrusive activities (18.85%) and least of highly intrusive activities (0.17%). Mildly intrusive activities were bathing, tepid sponge, clothes changing, the bed sheet changing, stroking and kissing during the sleeping, the taking and applying of medication, oral feeding, positioning, pulse and axillary temperature examination and lung and heart auscultation. Highly intrusive activities found during observation were wet dressing, intramuscular injection, intravenous fluid, which was not happen frequently. Mostly, caregiving activities (26.28%) occurred during the day. The highly and mildly intrusive activities occurred due to the conditions of the study subjects. Most of them who had been admitted to this ward had no serious health problems; therefore, they mostly received routine care. In addition, these age groups often received touch and care from their parents.

The Relationships between Sleep Disturbance Factors and Sleep Pattern

The findings revealed that light, noise, and caregiving activities were associated with reduced nighttime sleep, nighttime sleep interval, and greater number of night-awakenings. Correlations between the environment of light, noise and caregiving activities are consistent with previous reports (Baker, 1984; Corsor, 1996; Cureton-Lane & Fontain, 1992, 1997; Fontian, 1989; Hagemann, 1981a, 1981b; Hilton, 1976; Verran & Synder-Halpern, 1988). The nighttime is considered the best natural sleeping time of human being. Sleep is in remarkable harmony with the sleep during the hours of darkness and wakefulness during the daytime (Boorstin, 1987 cited by Brugne, 1994: 68). It is known that nocturnal light exposure near the temperature nadir may cause a phase shift in the circadian system resulting in a disturbance of the normal association of sleep with the light-dark cycle (Buresova et al., 1991; Lewy, et al., 1980 cited in Mayer, 1994: 1214). The nocturnal peak level equal 602 lux in the general pediatric unit, however, were well below the proposed threshold of 1,500 lux needed to affect the human circadian system (Lewy, 1983 cited in Campbell, 1993:829), but it could effect their sleep. Previous research sleep studies in patients in the hospital and nursing homes showed that light in the ward is an environmental effect to poor patient sleep (Cruise, et al., 1998; Schnelle, et al., 1998; Simpson, et al., 1996; Woods, 1972), the same as this study.

Noise from several sources appeared to interfere with sleep with children who were ill, such as equipment and alarms, other patients, staff talking and walking, telephone, television, opening-closing the door and noise out side the ward, etc. (Dodd, 1980 cited by Carter, 1985: 26; Southwell & Wistow, 1998: 1105). It can be explained that the nature of stimulation in the open ward gives patients little or no privacy from activities of others. The noise levels in a general pediatric unit represent levels that were significantly louder than the recommended Environment Protection Agency hospital daytime and nighttime values (US Environment Protection Agency, 1997). Levels of less than 35 dB were recommended for sleep (US Environmental Protection Agency, 1974; World Health Organization, 1980 cited by Hilton, 1985: 283). When the patients perceived auditory stimuli, reticular activity system and sympathetic system will be activated. These lead to increase wakefulness and greater number of night-awakenings, which result in reduced nighttime sleep interval and nighttime sleep and preventing complete sleep-wake cycles. Thus, the ill children had poor quantity and quality of sleep. These findings are consistent with previous studies (Corsor, 1996; Cureton-Lane & Fontain, 1992, 1997; Fontian, 1989).

Caregiving activities appear to be as disruptive to sleep patterns as is regular noise (Freedman, et al., 1999 cited by Redeker, 2000: 34). The activities, which often occur hourly (Meyer et al., 1994:), result in little uninterrupted time for patients to complete 60 minutes sleep cycles (Edwards & Schuring, 1993; Meyer et al., 1994; Walker, 1972). As well as disturbances that occur during the night include bathing, tepid sponge, trousers or clothes changing, the bed sheet changing, touching, stroking and kissing during the sleeping, the taking and applying of medication, oral feeding, positioning, vital signs measurement, aerosal therapy, installation of intravenous medicine, and intravenous fluid. Caregiving activities from parents sometimes help to promote sleep such as touching, and stroking during the awakening. Patients' sleep deficit in the hospital may be due to the result of early waking (Southwell & Wistow, 1995: 1102). For example, a study of the sleep of 93 surgical patients attributed much to the deficit to this cause (Murphy et al., 1977: 1521). Patients have too little time available for sleep. This study situation which, to a large extent, has been attributed to patients being waken up early in the morning (Carter, 1985:25) due to routine care starting at 5.00 a.m.

The findings revealed that environmental temperature was negatively correlated with daytime sleep but had no significant correlation with nighttime sleep, nighttime sleep interval, and night- waking. Because it rained some nights, thus, it was not too cold or hot, which did not result in uninterrupted sleep time. Kendel and

Schmidt-Kessen (1973 cited in Closs, 1988: 50) pointed out that unclothed and uncovered subjects awoke from cold at 26 degree Celsius and below. However, the daytime was very hot, peak temperature was 37 degree Celsius and more variation. Being too cold or too hot exhibited a reduction in REM and soundness period, and marked increased in the number and duration of wakefulness (Closs, 1988: 50; Glozbach & Heller, 1994: 262; Libert et al., 1991: 24). A cool temperature is more conducive to sleep than warmer temperatures. The benefits of cool versus moderate room temperature matter of personal preference; however, research has shown that excessive warmth or cold increased restlessness (Rochrs et al., 1994: 435). No significant correlations were identified between light, noise, caregiving activities, and daytime. Mostly, higher levels of light during the day had no significant correlations with daytime sleep. It is unlikely that the short duration of exposure over 1,000 lux would result in a circadian phase shift. It is more likely that the bursts of light in this area would result in sleep arousals in the patients exposed. These environmental influences keep the sleep-wake cycle on a 24 schedule with sleep occurring at night. If the normal entraining factors are removed or disrupted, the human sleep-wake cycle may deviate from its normal 24-hour period and lengthen to 25-26 hours (Czeisler, 1981: 1). If this occurs, the sleep-wake may deviate from light-dark schedule and sleep periods may occur during daylight hours and not at night (Meyer, 1994: 1212). Normally, these disturbing factors occur during the daytime period which is the awake period. Therefore, they are rare sleep disturbances. The findings revealed that noise, environmental temperature, and caregiving activities were negatively correlated with total sleep time. Combining nighttime sleep and daytime sleep showed the total sleep time in a 24-hour period. The ill children had a decrease in nighttime sleep by these arousals, which resulted in an overall decrease in total sleep time. However, light was not significantly correlated with the total sleep time because the light levels at night had a much more variance than the daytime.

Limitations of this study

Although certain correlations between sleep disturbance factors and sleep pattern did reach statistical significance, this study still was limited with data collection of light, noise, environmental temperature, caregiving activities, and sleep-awaken behavior which was recorded every 5 minute intervals. They may have occurred more rapidly than noted by a 5 minute sampling. Therefore, this data might be missing some recordings at this time. With the method of observation in this study, the quality of sleep could not be measured. In addition, the findings cannot be generalized to other settings in Thailand.

CHAPTER VI

CONCLUSION

This descriptive study aimed to investigate the relationship between sleep disturbance factors (light, noise, environmental temperature and caregiving activities) and sleep pattern of 1 to 2 year old ill children. The sample populations of this study were 1 to 2 year old ill children who were admitted at the general pediatric unit of Ban Pong Hospital. Data was collected during a 3-month period from March to May, 2002. Twenty subjects who met the inclusion criteria and agreed to participate were included in the study.

The instrument used in the study were as follows:

1. The research instruments: 93408 Digital Lux Meter, GA123 Sound Exposure Meter, Bannan thermometer and a clock.

2. Data collection instruments: the demographic data form and sleep-awakening data form. Data was collected by observation method. Statistical Package was used for data analysis.

The results of the study are reported below:

1. The findings of the sleep pattern of 1 to 2 year old ill children in the general pediatric unit showed that the ill children had less nighttime sleep and total sleep time in comparing with the recommendations. Moreover, they had short night sleep intervals, and greater number of awakenings. In addition, they had normal or increased daytime sleep, which is the result of increased napping during the day.

2. The findings of the sleep disturbance factors (light, noise, environment temperature and caregiving activities) showed that the light levels showed normal rhythmicity with peak levels (2000 lux) occurring during the daylight hours and low levels (1 lux) occurring at night. The mean noise level at the day and the night minimally exceeded the recommended level, which was 62.36 and 58.48 dB, respectively. The lowest and highest temperature was 27 and 37 degree Celsius. The highest temperature occurred during the daytime and the lowest temperature mostly occurred at night. The caregiving activities were the most of the mildly intrusive activities (18.85%) and the least of the highly intrusive activities (0.17%). Mostly, caregiving activities (26.28%) occurred during the day.

3. The result of Pearson's product moment correlation testing revealed that light was statistically significant with a moderate negative correlation with nighttime sleep and nighttime sleep interval ($r = -.648$ and $r = -.700$, $p < .01$ respectively) and statistically significant with a moderate positive correlation with night-waking ($r = .564$, $p < .05$). Noise was statistically significant with a moderate negative correlation with nighttime sleep and nighttime sleep interval ($r = -.548$, $p < .05$ and $r = -.677$, $p < .01$, respectively) and statistically significant with a moderate positive correlation with night-waking ($r = .628$, $p < .01$). Caregiving activities were statistically significant moderate negative correlation with nighttime sleep and nighttime sleep interval ($r = -.571$ and $r = -.621$, $p < .01$, respectively) and statistically significant moderate positive correlation with night-waking ($r = .625$, $p < .01$). Only environment temperature was statistically significant with a moderate negative correlation with daytime sleep ($r = -.506$, $p < .05$). In addition, noise, environment temperature and caregiving activities were statistically significant with a moderate

negative correlation with total sleep time ($r = -.591$, $p < .01$, $r = -.480$, $p < .05$ and $r = -.601$, $p < .01$ respectively).

Implications and Recommendations

The finding from this study provides several important considerations for nursing practice, education, and further research.

Implications for nursing practice

Sleep-wake cycles and circadian rhythms, normal and impaired, are experienced by all human beings through out life and are one of the most basic human processes. Nurses are much more aware of this now than in the past. They are also aware of the basis for normal sleep-wake cycles and of ways in which this becomes impaired. In the general pediatric unit of Ban Pong Hospital, the findings revealed that environmental situation rarely effected the study sample's sleep pattern. However, these findings showed association with theory. Therefore, nurses need to be aware of the effects of the external stimuli so they can be better controlled. Thus, organizations in charge of care should established guidelines for standards of care for promoting rest and sleep, in which known disruptive stimuli are controlled. In the first place, it is important that patients' sleep should be disturbed as little as possible. Nurses need to be aware that patients are awake and to take steps to ensure that they are comfortable. They need to minimize the occasions on which they wake patients during the night; therefore, nurses should be careful for decreased environment disturbing sleep. Nurses must be aware on the benefits of their interventions to outweigh those of undisturbed sleep. Nurses should also be more aware of nurse they make in carrying out their duty throughout the night, and make sure that patients are protected from undimmed lights.

Lights can be dimmed and curtains pulled. For noise, ensure that regular checks are made on equipment and doors to reduce noise from sources. Noise from staff, televisions and radio can be reduced and the telephone should be placed on the lowest volume. Control of ward temperature can be difficult. Patients have different preferences; some prefer to sleep in airy rooms, others in hot-house surroundings. Good ventilation is conducive to sleep. In addition, careful scheduling of activities while hospitalized, such as medication administration and taking vital signs, is an important consideration to foster healthy sleep. Caregiving activities, while vital, can be organized to accomplish their goals while still providing uninterrupted time for patient rest. Policies and procedures that dictate performance of specified activities during the night hours need to be evaluated. If the timing is not critical to patient well being, alternative scheduling of activities should be implemented.

Recommendations for education:

Nursing curricula have, for the most part, placed little emphasis on the concept of sleep and even less on the cognitive, psychological, and physiological changes that occur because of inadequate sleep. Only nurses who are educated in normal sleep requirements, pattern of sleep acquisition, and techniques to facilitate sleep can intervene to prevent or minimize the deleterious effects of sleep disturbances. An awareness of sleep pattern and quality in hospitalized children should be also emphasized to student nurses. It would be good if nursing curriculum integrates contents of sleep and sleep disturbance factors into the course of care of pediatric patients.

Recommendation for further research:

Continued research in the area of sleep of hospitalized children is needed. The finding of this study provided baseline information of sleep pattern and sleep disturbance factors, which are useful for further research about sleep quality of different ages, sleep problems, other sleep disturbance factors, and children with acute or chronic illnesses. The ultimate goal should be to design intervention programs and test their effectiveness on sleep acquisition in hospitals.

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APPENDIX

APPENDIX A

INSTRUMENTATION

Part I: Demographic Data Form

PART II: Sleep-wake recording form

Part I: Demographic Data Form

Subject No ....

Age ....months. Sex......... H.N. ...................A.N. ....

Diagnosis ....

Date of observation ....

PART II: Sleep-wake recording form

Time		Sleep-wake Behavior		Pediatric unit environment				Note
		Sleep	wake	Light level	Noise level	Env. Temp.	Caregiving activities	
	.00							
	.05							
	.10							
	.15							
	.20							
16	.25							
	.30							
	.35							
	.40							
	.45							
	.50							
	.55							
	.00							
	.05							
	.10							
	.15							
	.20							
	.25							
	.30							
	.35							
	.40							
	.45							
	.50							
	.55							
	.00							
	.05							
	.10							
	.15							
	.20							
15	.25							
	.30							
	.35							
	.40							
	.45							
	.50							
	.55							

APPENDIX B

Names of The Experts

Names of the experts who tested the validity of the caregiving activity observation tool, sleep-awakening observation tool and sleep-awakening recording form.

1. Associate Professor Wilai Leesuwan

   Coordinator Pediatric Divition, Nursing Department, Faculty of Medicine, Ramathibodi Hospital, Mahidol University.

2. Associate Professor Dr. Panwadee Putwatana

   Nursing Department, Faculty of Medicine, Ramathibodi Hospital, Mahidol University.

3. Lecturer Siriluk Kaukuarmkrun

   Coordinator Pediatric Divition, Nursing Department, Faculty of Medicine, Ramathibodi Hospital, Mahidol University.

4. Associate Professor Kannikar Vichitsukon

   Pediatric Nursing Department, Faculty of Nursing, Mahidol University.

5. Lecturer Kanjana Siricharoenwong

   Pediatric Nursing Department, Kuakarun College of Nursing.

APPENDIX C

Consent to Participate in Research Study

เรื่อง ขอความร่วมมือในการให้บุตรหลานของท่านเข้าร่วมการศึกษาวิจัย

เรียน ผู้ปกครองของ ด.ช. / ด.ญ. ....

ดิฉัน นางสาว รัตติกาล งามเปี่ยม นักศึกษาพยาบาลปริญญาโท ภาควิชาพยาบาลศาสตร์ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล มีความสนใจที่จะศึกษาวิจัยเกี่ยวกับการนอนหลับ และสิ่งรบกวนการนอนหลับของเด็กป่วยอายุ 1-2 ปี ซึ่งการวิจัยครั้งนี้จะเป็นประโยชน์ต่อการพัฒนาการพยาบาลให้เหมาะสม และคุณภาพชีวิตที่ดีขึ้น การวิจัยครั้งนี้จะไม่สำเร็จลงได้ ถ้าไม่ได้รับความร่วมมือจากท่าน

ข้อมูลทั้งหมดจะถูกเก็บไว้เป็นความลับ และจะนำเสนอเพียงในภาพรวม ชื่อของบุตรหลานของท่านจะไม่ปรากฏในรายงานและในสถานที่อื่นๆ ท่านมีสิทธิที่จะเข้าร่วมหรือปฏิเสธการเข้าร่วมการศึกษาครั้งนี้ และการตัดสินใจของท่านจะไม่มีผลต่อคุณภาพการดูแลบุตรหลานของท่าน ในระหว่างที่ทำการศึกษาท่านสามารถถอออกจากการเข้าร่วมการศึกษาได้ตลอดเวลา

ขอขอบพระคุณในความร่วมมือ
รัตติกาล งามเปี่ยม
นักศึกษาพยาบาลปริญญาโท

ถ้าท่านยินดีอนุญาตให้บุตรหลานของท่านเข้าร่วมในการศึกษาวิจัยกรุณาเซ็นชื่อ

กระผม / ดิฉันยินดีให้บุตรหลานของกระผม / ดิฉันเข้าร่วมในการศึกษาวิจัยครั้งนี้

ลงชื่อ ....

(......................................)

BIOGRAPHY

NAME	Ratikan Ngampiam
DATE OF BIRTH	January 5, 1964
PLACE OF BIRTH	Ratchaburi, Thailand
INSTITUTE ATTENDED	Ratchaburi of Nursing College, Ratchaburi, 1983-1987: Bachelor of Science (Nursing & Midwifery) Mahidol University, 2000-2002: Master of Nursing Science (Pediatric Nursing)
POSITION AND OFFICE	1987-Present, Ban Pong Hospital, Ratchaburi, Position: Register Nurse 7