CHAPTER 2

REVIEW OF THE LITERATURE

The review of the literature in this study was concerned with the sleep quality and factors interfering with sleep among hospitalized elderly with medical illnesses. The outline of the literature review was as follows:

Sleep

- Sleep physiology
- Sleep quality
- Sleep quality assessment
  - Objective sleep data
  - Subjective sleep data
  - Association between objective and subjective sleep data

Sleep of the elderly during hospitalization

- Impact of hospitalization on sleep quality
- Factors interfering with sleep
  - Physiological factors
  - Routine nursing interventions
  - Environment factors
  - Psychological factors
    - Anxiety
    - Depression

Sleep

1. Sleep physiology

1.1 Sleep regulation

Sleep is defined as "an unconsciousness from which the person can be aroused by sensory or other stimuli" (Guyton & Hall, 1997, p. 488). During sleep, the body rests and does not respond to the environment, but a person can be aroused by external stimuli, such as calling his/her name, touching the body, light and noise from the environment (Kryger, Roth, & Dement, 2000; Malik, Hall, & Howard, 1998).

Sleep is probably caused by an active inhibitory process involving the reticular activating system and a dynamic interaction of neurotransmitters (Guyton & Hall, 1997). The control and regulation of sleep may depend on the interconnections between two cerebral mechanisms where one mechanism causes wakefulness and the other causes sleep. The reticular activating system (RAS) that is located in the upper brainstem is believed to contain special cells to maintain alertness and wakefulness. It has been found that the reticular activating system (RAS) releases catecholamines such as norepinephrine (Sleep research society, 1993 cited by Potter & Perry, 2001), and also the RAS receives visual, auditory, pain, and tactile sensory stimuli.

Furthermore, sleep may be produced by release of serotonin from specialized cells in the raphe sleep system of the pons and medulla. This area of the brain is also called the bulbar synchronizing region (BSR) (Potter & Perry, 2001). A laboratory study showed that when a drug which blocking formation of serotonin given to an animal, the animal did not sleep for several days (Guyton & Hall, 1997). It has been assumed that serotonin is a major transmitter substance associated with sleep.

An individual stays awake or falls asleep depending on the balance of impulses received from the cerebral cortex (touch), limbic system (emotions), and peripheral sensory receptors (sound, light). When people need to sleep, they close their eyes and relax their body position. As a result, a stimulus to the RAS declines, and if the room is dark and quiet, the stimuli further declines.

1.2 The stage of sleep

An electrophysiological monitor called a polysomnograph can identify sleep. It records an electroencephalogram (EEG), electrooculogram (EOG), and electromyogram (EMG). There are two phases in sleep, namely non rapid eye movement sleep (NREM) and rapid eye movement sleep (REM). Non-rapid eye movement (NREM) sleep is the period when there is slow eye movement. Rapid eye movement (REM) sleep is a period accompanied by rapid eye movement and twitching of distal and middle ear muscle activity (Berger & Williams, 1992; Lee, 1997; Kriger, Roth, & Dement, 2000).

The sleep cycle consists of four stages of NREM and one stage of REM sleeps (Kriger, Roth, & Dement, 2000). The characteristics of the first stage of non-rapid eye movement (NREM) sleep include being the lightest level of sleep, lasting only a few minutes, having slow rolling eye movements, being easily aroused by sensory stimuli, and decreasing physiological activity with a gradual fall of vital signs and metabolism by 10% to 30% (Guyton & Hall, 1997). It usually lasts 5% of the total sleep time for young adults and shifts to 7% to 11% of the total sleep time for elderly (Miller, 1995), and further increases in duration in chronic illness of the elderly (Berger & Williams, 1992; Lotfis & Glover, 1993).

The second stage of NREM is still light sleep. It lasts approximately 5 to 10 minutes. This is a period of sound sleep in which the person becomes more relaxed but is

still easily awoken by calling his or her name. It lasts for 50% of the total sleep time for young adults and is generally unchanged for older adults (Miller, 1995). However, there are more frequent awakenings in this stage for the elderly (Berger & Williams, 1992; Ellis & Nowlis, 1994; Lee, 1997; Loftis & Glover, 1993).

The third stage of NREM is the initial stage of deep sleep. It lasts for 15 to 30 minutes. During this stage a sleeper is difficult to be aroused. There is a decrease in the vital signs, metabolism, essential restorative functions, and decreased secretions of growth hormone. This period is not changed much for older adults, although it is reduced in chronic illness and in the elderly (Miller, 1995).

The fourth stage of NREM is the deepest stage of sleep, in which it is very difficult to awaken the person. There is a reduction of bodily functions which are essential for restorative functions, the muscles relax, vital signs are lower, and the hormonal response continues. This stage lasts 30 minutes and is 10% of total sleep time for young adults and very short especially in men, for older adults (Miller, 1995). There is also a reduction or absence in chronic illness and in elderly (Loftis & Glover, 1993).

Rapid eye movement (REM) sleep occurs for the first cycle approximately 90 minutes after the end of the NREM stages and takes a few minutes. Then in the later cycles REM stage takes longer and occurs about 70 minutes after NREM. During this stage a person usually has active dreaming, and is more difficult to be aroused than in any other stages. The vital signs fluctuate widely, the heart rate and respiration rate usually become irregular, which is characteristic of the dream state, increasing the brain metabolism and brain activity to as high as 20% (Guyton & Hall, 1997). For older adults, there is shorter sleep time, less intense, longer time to fall asleep, more frequent arousals and more time in bed (Carskadon & Dement, 2000; Miller, 1995).

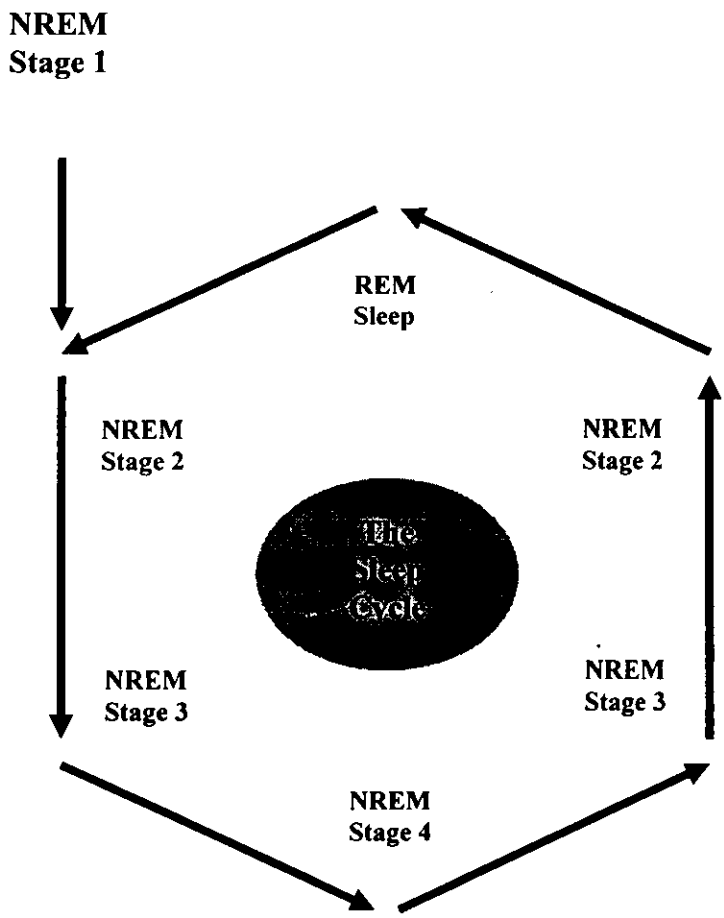

Figure 2 Diagram of the sleep cycle (From Fundamentals of Nursing Caring for the whole person 2003, USA: Delmar Publishers)

1.3 The functions of sleep

For more than two decades extensive research has failed to adequately explain the functions of sleep. The sleep experts still do not fully understand the functions of sleep. Many hypothetical functions of sleep have been proposed, but none of the hypotheses under active consideration have enough experimental support (Benington, 2000; Hodgson, 1991; Roehrs & Roth, 2000).

Sleep is believed to contribute to physiological and psychological conservation and restoration (Hodgson, 1991; Ebersole & Hess, 1998). The concept of homeostasis

may be extended to describe that energy that is expended during the day must be balanced by a restorative period. This forms the basis of the sleep function that conserves energy. Sleep conserves body energy by lowering the basal metabolic rate associated with slow delta wave sleep including oxygen consumption, heart rate, and body temperature (Shapiro & Flanigan, 1993).

Slow delta wave sleep has been associated with conservation of energy. The assumption is that people who have a higher metabolic rate during the day have more delta wave and longer sleep duration than people who have a lower metabolic rate. Similarly, a high expenditure of energy during the day is associated with an increase in both the duration of sleep and delta wave sleep (Guyton, 1997; Shapiro & Flanigan, 1993).

It has also been assumed that sleep serves as a period of body restoration (Guyton, 1997; Shapiro & Flanigan, 1993). The lower metabolic rate during sleep provides a period of increasing protein synthesis and cellular division for repairing and renewing epithelial cells (Ellis & Nowlis, 1994; Shapiro & Flanigan, 1993). Growth hormone, which enhances amino acid transport into cells that promote protein synthesis, is mainly released during the night in association with slow delta wave sleep.

Clearly, the functions of sleep that have been proposed describe sleep as protective, restorative, and serving to conserve the biological systems of human life. Lack of sleep is associated with physiological effects such as fall in body temperature, slight changes in cardiovascular and respiratory function, and slight hormonal changes that relate to anxiety, and psychological effects including increasing aggression, irritability, disorientation, and an inability to concentrate (Hodgson, 1991; Shapiro & Flanigan, 1993; Spenceley, 1993; Potter & Perry, 2001).

2. Sleep quality

Sleep quality is an important clinical construction to assess complaints and poor sleep. These can be symptoms of many sleep and medical disorders (Buysse et al., 1988). According to Ebersole and Hess (1998) "good" or "poor" sleep quality is a subjective judgment based on the body position, frequency of awakenings, and personal perception. Good sleepers usually have shorter sleep latency (less than 15 minutes), a few number of arousals, longer total sleep time, less body movement, and a feeling of being rested at the morning awakening. On the other hand, poor sleepers usually have longer sleep latency (more than 30 minutes), shorter sleep duration, and wake up at least once during the night (Beck, 1992; Knab & Engle, 1983 cited by Snyder-Halpern & Verran, 1987; Lushington, Dawson, & Lack, 2000).

Every person has different experience and perceptions regarding his or her sleep quality. Knowing how a person perceives his or her sleep quality is important, whether they consider themselves as "good or poor" sleepers. The sleep quality can be assessed in a subjects' previous night's sleep using instrument measures (laboratory setting or a set of questionnaires) with regard to a number of sleep parameters (Buysse et al., 1988; Ellis et al., 1981; Cohen, 1997).

Previous studies mentioned that sleep quality is concerned with subjective aspects of sleep disturbances; effect of pain, effect of dreams, ease of getting to sleep, soundness of sleep, and frequent awakenings (Johns, 1975a; Parrott & Hindmarch, 1980 cited by Shynder-Halpern & Verran, 1987). Buysse et al. (1988) stated that sleep quality comprised not only purely subjective aspects such as depth of sleep, but also quantitative aspects of sleep, such as sleep latency, total sleep time, and a number of arousals.

3. Sleep quality assessment

Sleep quality assessment is determined by the perception of the subjects' sleep (Buysse et al., 1988; Snyder-Halpern & Verran, 1987). In terms of research into sleep problems, there are several approaches to measure sleep quality. It could be measured by objective measurements like polysomnographic and observation, and subjective self-reports consisting of visual analogue and rating scales and interviews using a set of questionnaire. The questionnaire can be constructed with close ended and multiple-choice questions (Beck, 1992; Closs, 1988; Cohen, 1997).

3.1 Objective sleep data

Objective sleep recording is a physiological measure of sleep using a polysomnograph. Typical polysomnographic recordings of sleep subjects are electroencephalogram (EEG), eye movement activity by electrooculogram (EOG), which is useful to detect REM sleep, monitoring cardiac rhythms by electrocardiogram (ECG), and electromyogram (EMG) (Stromborg & Olsen, 1997).

Polysomnographic is the "gold standard" for monitoring sleep onset in REM sleep and NREM sleep stages 1, 2, 3, & 4 (Cohen, 1997; Closs, 1988). By using polysomnography, sleep quality can be identified accurately in each stage of sleep and its characteristics. The characteristics are sleep latency, total sleep time, duration of awakenings, and napping (Swift & Shapiro, 1993; Miller, 1995). Evans and Rogers (1994) used a polysomnograph to examine the 24-hour sleep/wake patterns in healthy elderly population. Furthermore, a study done by Pace-Schott, Kaji, Stickgold, and Hobson (1994) used a nightcap measurement at home to monitor REM sleep and NREM sleep, and observed body movements to measure sleep latency, sleep efficiency, and frequency of awakenings.

Observation of the sleeper can also be used to measure sleep during the night. Nurses, roommates, family members, videos and cameras can observe the patient's sleep behavior whether they sleep well or not. Lorrain and Koninck (1998) used photographic recording in a study on the relationship between sleep stages and sleep position.

3.2 Subjective sleep data

Subjective sleep report is one method to measure both sleep quantity and sleep quality aspects (Closs, 1988; Cohen, 1997). By interviewing using questionnaires, the researcher can assess a subject's sleep, which is considered as "good" or "poor". A variety of sleep questionnaires have been developed and modified to measure aspects of sleep quality (Cohen, 1997; Beck, 1992). These questionnaires can be structured to be more appropriate for use with hospitalized patients because of limitations of their reading and writing, and illness. This method is more effective because an interviewer can clarify the questions, but is time consuming (Closs, 1988).

This section presents the results of using questionnaires to measure sleep quality in care settings. Ersser et al. (1999) have developed a sleep pattern assessment tool (SPAT) and a subjective evaluation of sleep tool (SEST) to assess the sleep of older people in hospital. The SPAT and the SEST measure four elements of sleep quality including sleep pattern times, frequency of nighttime awakenings, daytime naps, and level of sleepiness.

The Pittsburgh Sleep Quality Index (PSQI) questionnaire (Buysse et al., 1988) is a self-rated questionnaire that provides an instrument to measure the quality and patterns of sleep in older adult population. The instrument is constructed to identify "poor" and "good" sleep by measuring sleep based on 7 components of sleep including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances,

use of sleeping medication, and day time dysfunction of sleep among elderly. It consists of 19 items with scores from 0 – 3, where 0 = very good, 1 = fairly good, 2 = fairly bad, 3 = very bad. The total possible score ranges from 0 – 21. The higher scores indicate more severe complaints and worse sleep quality (Buysse et al., 1988).

The St. Mary's hospital (SMH) sleep questionnaire (Ellis et al., 1981) is a 14-item multiple-choice and short answer instrument. It examines four sleep components; sleep latency, amount of sleep, sleep quality, and sleep satisfaction. Although this questionnaire was designed specifically for hospitalized adults, it is helpful in the clinical assessment of critically ill patients and it is possible to assess subjective aspects of sleep and perceived quality of sleep for other populations (Ellis et al., 1981).

According to Closs (1988), the visual analog scale (VAS) is an effective subjective method for assessing sleep quality of the elderly in the hospital. The scale is 4 inches long with the opposing statements "best nights sleep" and "worst night sleep" at each end of the line. The middle represents the average night's sleep. The patients were asked to place a mark on the horizontal line at the point of their perception of the previous night's sleep.

Many studies have used questionnaires, such as the sleep pattern assessment tool (SPAT) (Little-beck & Weinrich, 1998), the St. Mary's hospital sleep (SMH) questionnaire (Laempet, 2001) and the visual analog scale (VAS) (Freedman, Kodzer, & Schwab, 1999). Several studies have used PSQI with and without modifications to measure sleep patterns in the hospitalized patients, such as Manefe et al. (2000) who modified PSQI questionnaire to measure the sleep quality of the patients with chronic pain conditions. Owen, Parker, and McGuire (1999) used the PSQI questionnaire to assess the sleep quality of the healthy subjects and patients with cancer.

3.3 Association between objective and subjective sleep data

Polysomnography is considered the most accurate method to measure objective sleep parameters. This method is relatively difficult to perform and expensive. Many previous studies used both patients' report or subjective sleep data and objective measurements. They found an association between subjective and objective sleep data (Cohen, 1997; Edell-Gustaffsen, 2002).

Cohen (1997) reported a correlation of 0.84 between objective measures of sleep reported by a roommate and a self-report on sleep latency. Edell-Gustaffsen (2002) reported that objective sleep data was associated with several subjective sleep variables, while Briones et al. (1996) showed a strong correlation between multiple sleep latency test (MSLT) as an objective measurement and Epworth sleepiness scale (ESS) as a self report for patients in hospital with medical illnesses. The results were similar between MSLT and ESS. The MSLT ranged from 2 – 20 while ESS ranged from 0 – 24 minutes.

In summary, the important points in measuring sleep parameters are to fix the aspects to be measured, to objectively provide the use of the best instrument, and to interpret the results of examination by skilled personnel to validate issues and make them reliable. Although polysomnography is the "gold standard" to assess sleep patterns, it is not appropriate for this study because this method is relatively expensive, and is not available in either hospital in Medan, Indonesia.

Sleep of the Elderly during Hospitalization

1. Impact of hospitalization on sleep quality

Sleep is a basic human need and fundamental components of wellbeing (DeLaune & Ladner, 2002; Evan & Rogers, 1994). Many believe that a sufficient amount

of sleep makes a man "healthy, wealthy, and wise" (Hodgson, 1991). However, when the elderly were admitted to the hospital and became patients, they complained about the changes to their habits of sleeping at home and needed more adaptation to the new sleeping environment in hospital setting. The patients reported that they did not get enough sleep and were dissatisfied with the quality of their sleep during hospitalization (Foreman & Wykle, 1995; Southwell & Wistow, 1995).

The impact of hospitalization on patient's sleep quality has been documented by many studies (Craven & Hirnle, 2000; Miller, 1995). These impacts include taking longer time to fall asleep, sleeping less at night, waking more often during the night and waking up earlier, feeling dissatisfied with their sleep and having daytime-sleepiness. The patients did not consider that they had sufficient sleep during the night and rated their sleep quality as poor when they staying in the hospital (Martin & Ancoli-Israel, 2000; Potter & Perry, 2001; Southwell & Wistow, 1995).

Many factors, including nocturnal symptoms, discomfort, medications, hospital environment, anxiety and depression were found as the most common causes of sleep interference for the patients during hospitalization (Craven & Hirnle, 2000; Fordham, 1991; Thorpy, 1990; White, 2001).

Nocturnal symptoms due to frequent cough, dyspnea, angina pain, nocturia, discomfort from functional dyspepsia, and enforced position were found as common causes of sleep interference. Those symptoms make it difficulty for the patients to fall asleep, cause an increased number of arousals and a reduced depth of sleep at night (Chokroverty, 1999; Fordham, 1991; Calverly & Shapiro, 1993).

Some medications such as cardiovascular drugs, antihypertensives, diuretics, bronchodilators, antihistamines and corticosteroids used to treat diseases may also

interfere with sleep by causing more frequent awakenings, delayed sleep onset, frequent sleepiness and a decrease in the total sleep time (Kozier, Erb, Berman, & Burke, 2000; Potter & Perry, 2003; Staab & Hodges, 1996).

In a new environment sleep latency is increased and total sleep time is decreased. Elders have complained about sleep during hospitalization because of changes in the sleeping environment, no privacy and poor sleep hygiene. They are more likely to be awakened by noise from many sources in health care setting such as equipments, people and hospital staff. High room temperature, perhaps caused by inadequate cooling systems, also contributes to difficulty in staying asleep (Miller, 1995; Potter & Perry, 2003; Schmitt, et al., 1996; Shaver & Giblin, 1989; Thorpy, 1990).

Anxiety and depression are common findings in the hospitalized elderly medical patients due to worries about illness, social isolation, changes in life style and institutional admission. They may take more time to fall asleep, and have less deep sleep leading to more frequent arousals and difficulty returning to sleep at night (Craven & Hirnle, 2000; Miller, 1995; Reimer, 2000)

2. Factors interfering with sleep

A variety of factors have been identified as interfering with sleep during hospitalization. These factors include physiological, routine nursing interventions, environmental, and psychological factors (Miller, 1995). These factors affect sleep alteration with complaints of having difficulty in falling asleep, more frequency of awakenings, difficulty returning back to sleep, early morning awakening, reduction in the total sleep time, experiencing not feeling refreshed after sleep, less depth of sleep, and

dissatisfaction with sleep (Berger & Williams, 1992; Brill & Kilts, 1980; Kerr & Sirotnik, 1997; Lee, 1997).

2.1 Physiological factors

Sleep problems can be caused by symptoms of medical illnesses such as cardiovascular, respiratory, digestive, and renal diseases. There is strong evidence for a relationship between cardiovascular diseases and sleep interferences. Chest pain and irregular heart rate are symptoms of coronary artery diseases that can cause more frequent awakenings and change sleep stage from stage 3 and 4 to the lighter sleep of stage 2 (Potter & Perry, 2001). Moreover, hypertension has been found to cause early morning awakening (Potter & Perry, 2001). According to Reimer (2000) patients with CHF might have significant hypoxemia causing frequent arousals, and shorter total sleep time (Brostrom, Stromberg, Dahlstrom, & Fridlund, 2001).

Hypoxemia in patients with asthma and emphysema can contribute to difficulty in falling asleep and frequent arousals due to dyspnea, cough, and shortness of breath. Moreover, due to nocturnal oxyhemoglobin desaturation (NOD) patients with COPD experience arousals from sleep which are more frequent and severe (O'Donohue & Bowman, 2000). According to Williams, Karacan, & More (1988) asthma attacks have been found to cause increased frequency of nocturnal disturbances as sensitivity to histamine increases during the night. Thus, the incidence of asthmatic attacks is more frequent during the evening and during sleep than during the daytime.

Likewise, patients with diabetes mellitus face the risk of hypoglycemic attacks during the night with the symptoms of sweating, palpitations and hunger. These were causes of awakenings during the night and early morning headaches (Reimer, 2000). In

addition, many studies found that medical illnesses with various symptoms interfered with sleep during the night. These included dyspnea, cough, fever, pain, palpitation, headache, nocturia, incontinence, itching, nausea and vomiting, discomfort of sleeping position due to abdominal distention, mobility restriction, nasogastric tubes and intra venoustherapy.

Dyspnea and cough. Patients with respiratory diseases, that cause chronic airway limitations, such as bronchial asthma, emphysema, and chronic obstructive pulmonary diseases (COPD), suffer from the symptoms of dyspnea and cough during the night. These symptoms contribute to difficulty in maintaining asleep and more frequent arousals (Bradley, 1993; Reimer, 2000).

Fever. Fever is one response to bacteria or viral infection. It causes an increase in the duration of NREM with inhibition of REM sleep and, later, an inhibition of stage 3 and 4 NREM sleep (Shneerson, 2000). Also, fever had specific effects on nocturnal sleep including an increase in the awakening time and sleepiness (Glotzbach & Heller, 2000).

Pain. Having pain in any part of the body can make the patient awaken from sleep. Patients with angina have an increased frequency of awakening due to chest pain caused by angina attacks at night (Redeker, Tamburry, & Howland, 1998). Pain from duodenal and peptic ulcers often interferes with sleep due to increased gastric acid secretion (Larson, Halliburton, & Julio, 1993; Reimer, 2000). The chronic pain from rheumatoid arthritis, osteoarthritis, fibromyalgia, and headache may interfere with sleep. There was positive association between pain intensity and insomnia, and middle of the night awakening, and restless sleep (Menefee et al., 2000; Miller, 1995).

Palpitations. Palpitations which are a common symptom in patients' with cardiovascular diseases and the hypoglycemic reaction of diabetes mellitus can cause

sleep disturbances by awakening the patients at night (Reimer, 2000). Also Calverly and Shapiro (1993) explained that patients with lung disease commonly presents with palpitations which are worse at night. They have a higher incidence of arrhythmias during sleep may be because of nocturnal hypoxia and the effects of drugs that they are taking.

Headache. Patients particularly those with chronic migraine often reported awakening at night with a headache (Williams, Karacan, & More, 1988). Dexter and Weitzman's laboratory study (cited by Williams, Karacan, & More, 1988) showed a strong correlation between headache attacks and REM sleep and the headache commonly occurred during REM sleep period. Reimer (2000) mentioned that a hypoglycemic reaction with hunger and sweating might affect the awakening at night and early morning headaches. Another study showed that morning or nocturnal headaches were frequent indicators of sleep disturbances (Paiva, Batista, Martins, & Martins, 1995).

Nocturia. Patients with diabetes mellitus can experience nocturia and glycosuria due to inadequate regulation of blood sugar (Burnside, 1988; Ebersole & Hess, 1998). This condition disrupts sleep at night with awakenings and difficulty returning back to sleep (Potter & Perry, 2001). Patients given diuretics during evening hours may have to wake to urinate during the night. This may interfere with sleep and make it difficult to get back to sleep (Calverly & Shapiro, 1993; Kozier, Erb, Berman, & Burke, 2000).

Incontinence. Incontinence can be the consequence of the nocturnal gastrointestinal symptoms, such as fecal incontinence and nocturnal diarrhea. Those symptoms were identified as the causes of frequent awakenings from sleep and the inability to maintain sleep (Orr, 2000; Tabbner, 1981).

Nausea-vomiting. Duodenal and peptic ulcers often interfered with sleep during the night due to an increase in the gastric acid secretion causing nausea and vomiting

(Larson, Halliburton, & Julio, 1993; Reimer, 2000). Increased gastric acid secretion during REM sleep might contribute to difficulty in stay sleep (Berger&William, 1992).

Itch. Itching is a response to various skin conditions including atopic eczema, other skin lesions and insect bites and has been associated with decreased REM sleep, delayed sleep onset and more frequent awakenings. The itching sensation is felt deep in the muscle and relief comes only from moving the legs, which prevents relaxation and subsequent sleep (Craven & Hirnle, 2000; Potter & Perry, 2001).

Discomfort. Physical discomfort was the major cause of frequent awakenings and difficulty in falling asleep (Potter & Perry, 2001), and it could reduce the level of satisfaction with sleep (Roy & Andrews, 1999). In a study by Southwell and Wistow (1995) uncomfortable was found to be a major factor among patients who reported they did not get enough sleep at night. In addition, physical uncomfortable due to an unaccustomed sleeping position when constrained by abdominal distention, mobility restriction and treatments such as naso-gastric tubes and intravenous therapy may cause difficulties in sleeping (Tabbner, 1981).

2.2 Routine nursing interventions

The nurses' responsibilities during the night shift are to provide nursing care for the patients with some diseases especially during the phase of acute and severe illness. Nurses have duty to provide a good standard of patient care during the night. However, based on the nurses' proximity to their patients, sleep interfering may happen when nurse takes prompt patient care in active supervision, whereas passive supervision represented a withdrawal from sleeping area (Kemp, 1984; Fordham, 1991; Tabbner, 1981).

By doing routine nursing interventions during the night, nurses may awaken the patients from sleep. Nurses must observe patients once an hour or more and these

assessments and procedural interventions can interfere with the patients' sleep (Craven & Hirnle, 2000). Previous studies have indicated that major sources of sleep interference perceived by both patients and nurses on the wards during the night include nurses' routinely observing patients, attending to other patients, giving treatments and medicines, checking vital signs, doing admissions and early morning nursing activities (Laempet, 2001; Southwell & Wistow, 1995; Yilan, 2000).

2.3 Environmental factors

The elderly may have a difficulty time sleeping especially during the first few nights as an effect of new environment. Uncomfortable beds or pillows, bright light, poor ventilation, loud noises, no privacy and being unfamiliar with hospital environments were cited as significant environmental factors that interfere with sleep (Miller, 1995; Reimer, 2000; Southwell & Wistow, 1995; Yilan, 2000). According to Lee (1997) and Vitiello and Printz (1990) the elderly were more sensitive to noise from environmental stimuli due to less slow delta wave sleep and the auditory opening is much higher in deeper stages of sleep. So, they experience less NREM sleep in stages 3 and 4, and have less REM sleep.

Unfamiliarity with the hospital environment. The environment is very important for elders during hospitalization, because they have unique and different sleep habits, rituals of sleep and sleep patterns at home. Therefore, when they are admitted to the hospital, they may unfamiliar with the hospital environment, which may affect their ability to fall asleep and maintain sleep (Berger & Williams, 1992; Ellis & Nowlis, 1994; Redeker, 2000).

No privacy. A lack of privacy in the psychosocial setting can interfere with sleep, particularly when there are a large number of patients in a shared room, along with their

families and friends and this may cause a feeling of discomfort to certain patients. Patients may have conflicts with other patients or their family members. For older people who are sleeping alone or with family members may feel their privacy is being violated in hospital where they need to wear nightclothes, remove their dentures, and share a room with non family members (Laouri, Lepisto, & Kapeli, 1997; Miller, 1995; Southwell & Wistow, 1995; Webster & Thompson, 1986).

Uncomfortable bed/pillows. The size, firmness, and position of the bed can influence the ability to fall asleep and maintain sleep. Patients may feel restricted, fearful of falling and discomfort due to different type of bed. Height, length, and width from the one the patients are used to at home. As well, hospital beds are usually covered in plastic or a material that may cause the patient to feel hot and sweaty (Craven & Hirnle, 2000; Potter & Perry, 2001).

Noise. It is well know that hospitals are noisy places and can cause sleep deprivation. The level of noise that can wake patients depends on the sleep stage they are in. Low noise may arouse patients in stage 1 of sleep, but a loud noise is needed to wake those in stage 3 and 4 of sleep. The sources for high noise levels on the wards include noise from equipment, other patients and family members, and from conversation among health care teams (Hilton, 1976; Miller, 1995; Potter & Perry, 2001; Webster & Thompson, 1986).

Lighting. An unfamiliar or unsuitable environment due to bright light may influence the ability to fall asleep and remain asleep. A person accustomed to dim light while sleeping may find it difficult to sleep in bright light (Berger & William, 1992; Lee, 1997; Potter & Perry, 2001). It was found that elderly patients sleep best with dimmed lights at home, but during hospitalization the bright lights on all night in the wards and

flash light during nurses' routine ward rounds interfered with their sleep and made it difficult to fall asleep and maintain sleep (Laempet, 2001; Yilan, 2000).

Room temperatures. An uncomfortable room temperature, either too hot or too cold can contribute to less efficient sleep, as during REM sleep, internal thermoregulation is absent and sweating cannot occur in response to cold or heat. Thus, REM sleep stages are decreased when the environmental temperature is too cold or too hot (Miller, 1995; Roy & Andrews, 1999). This explanation is consistent with a previous study which mentioned that excessively warm or cold rooms can inhibit sleep, while a temperature comfortable to the individual promotes sleep (Berger & Williams, 1992).

Poor ventilation and unpleasant odors. Several environmental factors can interfere with normal sleep. Among these are stimuli unpleasant odors and poor ventilation (Berger & William, 1992; Kozier, Erb, Berman, & Burke, 2000; Roy & Andrews, 1999). According to Webster and Thompson (1986) good ventilation is essential for sleep. Too much or too little fresh air from air conditioning or open windows may also interfere with sleep. Research has shown that 17% (N= 100) of the subjects reported that unpleasant odors in the wards interfered with their sleep (Yilan, 2000).

2.4 Psychological factors

Medical illness and hospitalization are psychological stresses that can influence sleep. Change in life-style due to having a chronic illness and worry about the illness, treatment and diagnostic procedures, hopelessness, fear of death and uncertain conditions, financial concern, isolation from families and friends, unfamiliarity with the hospital environment have been all cited as sources of anxiety and depression during hospitalization (Craven & Hirnle, 2000; Hodgson, 1991; Webster & Thompson, 1985; White, 2001).

Anxiety. Grimm (1997, p. 329) described anxiety as "an unpleasant subjective experience associated with the perception of real or imagined threat". A patient with stress releases extra corticosteroids and adrenalin, which lead to more catabolism, sleeplessness and more anxiety (Hodgson, 1991). Thus it is evident that anxiety is a risk factor for poor sleep during hospitalization. Several factors play important roles in causing anxiety for elderly patients. The patients' risk factors for anxiety were worry about their illness, treatment and unfamiliarity with the hospital environment, isolation from family and inability to make realistic plans for the future (Berger & Williams, 1992; Hodgson, 1991; Yilan, 2000).

According to Closs (1988) in a review of assessment of sleep in hospitalized patients, anxiety was associated with longer sleep latency and more awakenings at night, while Fordham (1991) mentioned that anxiety may interfere with difficulty in falling asleep, frequent awakening during the night and early morning arousal.

Depression. Depression can be identified by symptoms of feeling sad, worried or unworthy and dissatisfied with themselves (Lynch & Stevens, 1985). These symptoms were found in hospitalized elderly patients (Miller, 1995; Redeker, 2000). Previous studies showed that depression was a common finding in hospitalized elderly patients with a prevalence of 10% – 59% (Laury, Lepisto, & Kappeli, 1997; Steiner, Yonkers, & Eriksson, 2000). As found previously, elderly patients with cancer, diabetes mellitus, hepatic diseases, cardiovascular and respiratory diseases, and physical disabilities were associated with significant depression during hospitalization.

Many studies have shown a relationship between depression and sleep disturbances in acute or chronic medical illnesses (Redeker, 2000). Cartwright (1985) mentioned that the depressed, whether inpatient or outpatient, endogenous or reactive,

showed REM sleep disturbances to various degrees. Moreover, Miller (1995) and Closs (1988) reported that depression was associated with difficulty in falling asleep, less deep sleep, more awakening at night, early morning awakening, and not feeling refreshed when waking in the morning. The subjects' experiences might reflect some aspects of the depressed condition such as physical illness, severity of disease, and medical treatment. But, this explanation was contradictory with a study by Ancoli-Israel (2001), which reported that depression did not seem to be a significant factor affecting sleep.

In summary, regarding the effects of anxiety and depression on sleep patients, it has been found that as anxiety and depression increased, sleep periods decreased and promoted anxiety and depression for the patients (Hodgson, 1991). During times of psychological stress, including anxiety and depression, the elderly might suffer from spending more time in trying to falling asleep, have more frequent awakenings, have early morning awakenings, and not feel refreshed when they wake up in the morning (Closs, 1988; Miller, 1995; Roy & Andrews, 1999).