FOLLOW UP STUDY OF PATIENTS' ADAPTATION AFTER MILD HEAD INJURY

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ABSTRACT

This descriptive study aimed to investigate the patient's adaptation after mild head injury and to compare adaptation in terms of postconcussion symptoms (PCS) and behavior in daily living between the 2nd and the 8th week after injury. The sample was 60 patients with head injuries who visited the emergency room, Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University. They were selected based on inclusion criteria: 1) 15 - 60 years of age at the time of injury; 2) Glasgow Coma Scale score (GCS) of 13 to 15 on admission and through out hospitalization, no evidence of cerebral hemorrhage; 3) no history of significant head injury, alcoholism, mental retardation, and psychiatric disorder (e.g.schizoprenia, manic depressive illness); 4) Thai literacy; and 5) agreed to participate in the study. The instruments used in the study were the Clinical Data Form, the Demographic Questionnaire, the Rivermead Post Concussion Symptoms Questionnaire (RPQ), and the Sickness Impact Profile (SIP). Data were analyzed using descriptive statistics, and Wilcoxon Match Paired Sign Rank Test.

Sixty patients were included in this study, 31 males and 29 females. At the end of the 8th week after injury 61.7 percent of all the patients still had postconcussion symptoms (PCS). Eight patients had no symptoms at the end of the 2nd and the 8th week after injury. There were statistically significant differences ($p < 0.01$) between adaptation at the end of the 2nd and the 8th week after mild head injury. The score of RPQ at the end of the 8th week was significantly less than the score at the end of the 2nd week after injury, and the SIP score at the end of the 8th week is significantly less than the score at the end of the 2nd week after injury. The results of this study provided important information to nurses for development of specific intervention for patients with mild head injuries before and after discharge to enhance their adaptation.

KEY WORDS : MILD HEAD INJURY / POSTCONCUSSION SYMPTOMS/ ADAPTATION / ACTIVITY OF DAILY LIVING

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การศึกษาติดตามการปรับตัวของผู้ป่วยหลังได้รับบาดเจ็บที่ศีรษะระดับเล็กน้อย (FOLLOW UP STUDY OF PATIENTS' ADAPTATION AFTER MILD HEAD INJURY)

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บทคัดย่อ

การศึกษาครั้งนี้เป็นการวิจัยเชิงบรรยาย เพื่อศึกษาติดตามการปรับตัวหลังการได้รับบาดเจ็บที่ศีรษะระดับเล็กน้อยโดยเน้นในเรื่องกลุ่มอาการหลังการบาดเจ็บที่ศีรษะและผลกระทบของการบาดเจ็บที่มีผลต่อชีวิตประจำวัน และเปรียบเทียบการปรับตัวในสัปดาห์ที่ 2 และ สัปดาห์ที่ 8 หลังการได้รับบาดเจ็บ กลุ่มตัวอย่างจำนวน 60 ราย เป็นผู้ป่วยบาดเจ็บศีรษะที่เข้ารับการรักษาในโรงพยาบาลมหาราชนครเชียงใหม่ คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ มีคุณสมบัติตามเกณฑ์ที่กำหนด คือ (1) มีอายุ 15-60 ปี ขณะแรกรับไว้ในโรงพยาบาล (2) มีระดับความรู้สึกตัวตามกลาสโกว์โคมาสเกล 13-15 คะแนน ตั้งแต่แรกรับและตลอดระยะเวลาที่พักรักษาตัวในโรงพยาบาล (3) ไม่มีประวัติเกี่ยวกับการบาดเจ็บที่ศีรษะ พิษสุราเรื้อรังหรืออาการทางจิตมาก่อน (4) สามารถพูด อ่าน และเขียนภาษาไทยได้ และ(5) ยินดีเข้าร่วมในการวิจัย เครื่องมือที่ใช้เก็บข้อมูลคือ แบบบันทึกเกี่ยวกับการรักษา และแบบสอบถามจำนวน 3 ชุด ประกอบด้วย แบบสอบถามข้อมูลส่วนบุคคล แบบประเมินอาการหลังการบาดเจ็บศีรษะ อาร์ พี คิว และแบบสอบถามผลกระทบความเจ็บป่วย นำข้อมูลมาวิเคราะห์ด้วยสถิติบรรยาย และการทดสอบแบบวิลค็อกสัน

ผลการศึกษาพบว่าสัปดาห์ที่ 8 หลังการได้รับบาดเจ็บที่ศีรษะระดับเล็กน้อย ผู้ป่วยร้อยละ 61.7 ยังคงมีอาการที่เกิดจากผลกระทบของการบาดเจ็บที่ศีรษะ ผู้ป่วยจำนวน 8 ราย ไม่มีอาการหลังบาดเจ็บที่ศีรษะทั้งในสัปดาห์ที่ 2 และ สัปดาห์ที่ 8 และพบว่าหลังการได้รับบาดเจ็บที่ศีรษะระดับเล็กน้อยในสัปดาห์ที่ 2 และ สัปดาห์ที่ 8 ผู้ป่วยมีการปรับตัวแตกต่างกันอย่างมีนัยสำคัญทางสถิติที่ $p < 0.01$ กล่าวคือ คะแนนกลุ่มอาการหลังบาดเจ็บที่ศีรษะในสัปดาห์ที่8 น้อยกว่าคะแนนกลุ่มอาการหลังบาดเจ็บที่ศีรษะในสัปดาห์ที่2 อย่างมีนัยสำคัญ และคะแนนผลกระทบจากการบาดเจ็บที่มีผลต่อชีวิตประจำวันในสัปดาห์ที่ 8 น้อยกว่าคะแนนผลกระทบที่มีผลต่อชีวิตประจำวันในสัปดาห์ที่ 2 อย่างมีนัยสำคัญ การศึกษาครั้งนี้เป็นสิ่งสำคัญสำหรับพยาบาลในการวางรูปแบบการพยาบาลในผู้ป่วยบาดเจ็บที่ศีรษะระดับเล็กน้อยตั้งแต่แรกรับจนต่อเนื่องหลังการจำหน่ายออกจากโรงพยาบาล เพื่อเป็นการส่งเสริมให้ผู้ป่วยสามารถปรับตัวและฟื้นหายจากอาการได้ในระยะเวลาเร็วขึ้น

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Thanaporn Premsai

CONTENTS

LIST OF TABLES

CHAPTER I
INTRODUCTION

Background and Rationale

Trauma continues to occur in epidemic proportions in our society today; however, this is not a new phenomenon. Traumatic injury has been recognized as a part of the human experience since early civilization. Trauma is a significant public health problem (Jaturong Tepahudee & Nakornchai Phuenpathom, B.E.2542) that affects all ages and all levels of society. There has been a steady increase in the numeric of individuals sustaining traumatic injury. For the Thai population, trauma is the second leading cause of death, exceeded only by death occurring from cardiovascular disease (Ministry of Public Health, B.E.2542). The most common cause of traumatic injuries are the road accidents. It is estimated that more than one million injuries occur annually in this country. In 1998, of the total number of traumatic injuries that occurred 14,400 resulted in death. Most of deaths are the result of a head injury (Chammiparn Santikarn, et. al., B.E.2541; Sakchai Tangchitvittaya, B.E.2542). Each year, more than 174,000 people sustain some type of head injury from road accidents (Neurosurgical Association of Thailand, B.E.2541).

The severity of a head injury frequently is classified according to the Glasgow Coma Scale score (GCS) into severe (score of 3-8), moderate (score of 9-12), and mild (score of 13-15) (Borczuk, 1997: 565). Patients with severe and moderate head injuries have received the most attention. They require admission to the intensive care unit for critical management, whereas many patients with mild head injuries are not hospitalized. The importance of proper diagnosis of this type of injury cannot be overemphasized. The definition of mild head injury in the medical literature has been confusing (Sa-nguansin Ratanalert, B.E.2542; Sakchai Tangchitvittaya, B.E.2542). In addition, many patients with mild head injuries do not seek medical attention.

Because of these problems, the accurate incidence of mild head injury is difficult to estimate (Shackford & Walde, 1999: 155). The percentage of patients with mild head injuries requiring a neurosurgical procedure is much smaller. Abnormal computed tomography occurs in 10 to 16 percent of patients with mild head injuries who have normal level of consciousness (Torner, et. al., 1999: 10). In a meta analysis of four studies (Shackford & Walde, 1999: 157-159) including a total of 6,060 patients with mild head injuries, 2 to 8 percent had a hematoma requiring a craniotomy. The patient is usually observed in the emergency room for a few hours or perhaps admitted overnight for observation. The patient is discharged to home with the expectation that he or she will gain a full recovery. Nevertheless, it is common to see patients with mild head injuries suffering from significant postinjury sequelaes such as postconcussion symptoms (PCS) for a few weeks to a few months (McNair, 1999: 637).

In PCS, patients with mild head injuries complain of headaches, dizziness, fatigue, irritability, reduced concentration, sleep disturbance, memory dysfunction, anxiety, sensitivity to noise or light, double or blurred vision, and depression (Bryant & Harvy, 1999: 302; Mahon & Elger, 1989: 383; Miller & Jones, 1990: 224; Wade, et. al., 1997: 487). Levin and colleagues (1987: 234) found that during the first week after injury, the percentage of patients reporting PCS range from 82 to 93 percent. Twenty-four percent to 84 percent of them will experience late PCS for up to 3 months after the injury. In addition, 14 percent of them will continue to experience those symptoms one year after injury (Gunsett & Mysiw, 1992: 258). Others studies (Borczuk, 1997: 574; Gronwall & Wrightson, 1981: 889) found that about 75 percent of patients with mild head injuries recovered to a normal level by 4 to 6 weeks.

PCS have a range from transient mild symptoms to severe problems. Mild head injury results in problems that can have an impact on social relationships, employment, and routine daily functions (Kushner, 1998: 1617). For example, Uomoto and Esselman (n.d., cited by Andary, et. al., 1993: 141) reported that 89 percent of all patients with mild head injuries had headaches complaints. While only 22 percent moderate or severe head injury patients complained this problem. This chronic pain interfered with daily activities. A study of 1,216 patients with mild head injuries (Gunsett & Mysiw, 1992: 268) demonstrated that 52 percent of patients were

back to work within 2 weeks or less after the injury. However, 31 percent of those previously employed had not successfully return to work at 6 weeks after the injury.

Mild head injury often receives attention from health care provider less than moderate and severe head injuries (Sa-nguansin Ratanaslert, B.E.2542). Clinical and experimental research related to head injuries during the last 20 years has focused on the severe injuries in adults (Marion, 1999: 6). It may be because mild head injury poses a very slight life threatening. Nevertheless, one-third or more of patients with mild head injuries have PCS, which may limit their physical and psychosocial abilities to function at home or at work. These patients cope with injuries and its sequelaes in order to maintain balance of their life and well-being. However, study related to optimal treatment and outcomes after mild head injury are less than those for severe head injury (Hinnant, 1999: 187; Levin, 1996: 751). Especially, there are few studies among Thai people with mild head injury. Therefore, this research aims to study patient's adaptation after mild head injury. This knowledge enables nurses to develop appropriate intervention that may facilitate adaptation and provide anticipatory guidance upon discharge.

Conceptual Framework

The Roy Adaptation Model (Roy & Andrews, 1991: 4-48) was used as the conceptual framework for this study. According to this model, a person is a bio-psycho-social holistic being who constantly interacts with a dynamic environment and must change continually to adapt to environmental stimuli. The human adaptive system receives input from the external environment and from the internal person that are categorized into three classes: focal stimuli, contextual stimuli, and residual stimuli. The focal stimuli are those most immediately confronting the person. The contextual stimuli are the contributing factors in the situation that contribute to the effect of the focal stimuli. The residual stimuli are the unknown factors that may influence the situation. When the factors making up residual stimuli become known, they usually are considered contextual stimuli.

Roy conceptualizes a person as an adaptive system with cognator and regulator coping processes, and categorized behavior resulting from coping processes to environmental stimuli into four modes: physiological, self-concept, role function, and

interdependent modes. The four modes are interrelated, such that responses for any one mode may have an effect on or act as a stimulus in one or all of the other modes. The person's behavioral responses can be either adaptive or ineffective. Adaptive responses of the person are those that contribute to the person's goals for survival, growth, reproduction, and mastery; ineffective responses are those that do not contribute. These responses act as feedback or further input to the system, allowing a person the decide whether to increase or decrease efforts to cope with stimuli.

Using the Roy Adaptation Model, this study viewed traumatic event as the focal stimulus that activates behavioral response in four modes by patient with mild head injury. These modes are physiological, self-concept, role function, and interdependence. Behavior in the physiological mode may have an effect on or act as a stimulus for one or all of the other modes. The four modes were viewed as the PCS and behavior on daily living after injury.

Research Objectives

The objectives of this research were

1. To investigate the patient's adaptation at the 2nd and the 8th week after mild head injury in terms of postconcussion symptoms and behavior on daily living.

2. To compare the postconcussion symptoms of the patients with mild head injury between the 2nd and the 8th week after having injury.

3. To compare behavior on daily living of the patients with mild head injury between the 2nd and the 8th week after having injury.

Research Hypotheses

1. Postconcussion symptoms of the patients with mild head injuries at the 2nd week after injury are different from the 8th week after injury.

2. Behaviors in daily living of the patients with mild head injuries at the 2nd week after injury are different from the 8th week after injury.

Scope of the Study

This descriptive research studied adaptation of the patients at the 2nd and the 8th week after having mild head injury. Sixty patients with mild head injuries were obtained from the emergency room and surgical wards of Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University.

Expected Outcome and Benefits

The results of this study indicate specific data or information related to a patient's adaptation after mild head injury with regard to PCS and behavior in daily living. This information will be helpful for nurses and other health care providers in planning appropriate and effective intervention to prevent and manage problems after injury and to promote patient's effective adaptation.

Definition of Terms

1. Adaptation is manifest behavior both physiological and psychosocial, which are responses to mild head injury. These behaviors are evaluated from postconcussion symptoms (PCS) and behavior in daily living. The subjects reported adaptation by answering each item on two instruments: the Rivermead Post Concussion Symptoms Questionnaire, and the Sickness Impact Profile. Higher scores indicate more ineffective adaptation.

1.1 Postconcussion symptoms (PCS) is a cluster of symptoms that often follow mild head injury. It was measured by the Rivermead Post Concussion Symptoms Questionnaire (RPQ). Higher scores indicate more ineffective adaptation.

1.2 Behavior in daily living are functional status after having mild head injury. It was measured by the Sickness Impact Profile (SIP). Higher scores indicate more ineffective adaptation.

2. Duration after injury is a number of weeks after the date of injury; 2nd and 8th week after injury are 10 to 21 days and 52 to 63 days after the date of injury, respectively.

CHAPTER II
LITERATURE REVIEW

This study investigates patient's adaptation after mild head injury. The researcher reviewed literatures for this study and presented in sequence as follows:

1. characteristics of head injury;
2. assessment of level of consciousness;
3. defining mild head injury;
4. type of mild head injury;
5. outcome of mild head injury;
6. recovery after mild head injury; and
7. the nurse's role.

Characteristics of Head Injury

Head injury means complex mechanism loading to the head and/or the body that cause the injuries to the scalp, skull, brain, and cranial nerve (Neurosurgical Association of Thailand, B.E.2540) and may have intracranial hematoma or blood vessel injury (Dumrong Pavilai, B.E.2524). Jennett (1996a: 364) explained that head injuries that have altered consciousness or neurological signs are called brain injury. However, many researchers often used the term "head injury" and "brain injury" as the same meaning (Kraus, et. al., 1996: 13).

Siri Boonyaratavet (B.E.2526) suggested clinical criteria that are used to identify trauma as head injury. These criteria were from Scottish Accident Departments are as follows: 1) history of any blow to the head, 2) laceration wound at scalp or forehead, and 3) alteration of consciousness at any time. A patient with only one or more of these criteria is called patient with head injury. A patient with facial laceration, facial fracture, and foreign bodies in the nose or ears are not head injury.

However scalp, skull, or brain may each be injured independently of the other (Jennett, 1996: 363).

Traumatic head injury may occur with or without evidence of external trauma following violent contact forces or rapid acceleration / deceleration movements of the head (Hickey, 1997: 387). The usual causes include assaults, crashes, and accidents involving motor vehicles, bicycles, pedestrians, construction, and sports. Definitive signs (Kushner, 1998: 1617) must be present at the time of head trauma for a head injury to be diagnosed. These signs include confusion, loss of consciousness, amnesia, and focal neurological deficits. However, changes in the level of consciousness constitute the earliest sign of neurologic deterioration after head injury

Assessment of level of consciousness

The level of consciousness is the most sensitive indicator of head injury (Kelly, 1999: 67). There are two components of consciousness (McQuillan & Mitchell, 1994: 415): arousal and cognition or awareness. Arousal is mediated by the ascending reticular activating system, which carries sensory stimuli from the environment to the cortex, activating consciousness. This system is so diffuse that injury in just about any part of the brain can disrupt or compress the reticular activating system, resulting in alteration of consciousness.

Arousal is assessed by determining the type of stimulus necessary to arouse the patient. The patient may be alert and responsive as soon as he or she is approached. If the patient is not alert, the assessor should begin with the least noxious stimulus (Marchall, et. al., 1990: 99-100) to attempt to elicit a response from the patient. If that is unsuccessful, slight shaking can be attempted, then peripheral pain or nail bed pressure, and finally central pain. Central pain can be applied by sternal rub or exerting pressure to the superior aspect of the periorbital region of the eye. Injuries to the specific areas obviously contraindicate application of pressure. If the patient is arousable, awareness can also be assessed. This entails evaluation of the various cerebral cortical functions, such as memory; affect; ability to perform intellectual functions; and orientation to person, place, time, and situation (Kraus, 1999: 177-178).

In an attempt to refine and standardize observations for objective assessment of the level of consciousness, the Glasgow Coma Scale (GCS) (Teasdale & Jennett,

1974: 81-84) was developed at the University of Glasgow, Scotland. The scale was designed to assess the level of consciousness in patients with head injury. Since its introduction, the GCS has been adopted worldwide including Thailand (Marion, 1999: 4; Sanguansin Ratanalert, B.E.2542). The scale is divided into three areas of focus, which include eye opening, best verbal response, and best motor response. The score ranges from 3 to 15, with a summing score of the three areas as follows:

1. Eye opening;
   - spontaneous 4 marks
   - to verbal stimuli 3 marks
   - to pain 2 marks
   - never 1 mark.
2. Best level response;
   - oriented 5 marks
   - confused conversation 4 marks
   - inappropriate word 3 marks
   - incomprehensible sounds 2 marks
   - no verbal response 1 mark.
3. Best motor response;
   - obey commands appropriately 6 marks
   - localizes to pain stimuli 5 marks
   - withdraws from pain stimulation 4 marks
   - abnormal flexion response 3 marks
   - abnormal extension response 2 marks
   - no motor response 1 mark.

Based upon this figure, certain deductions can be made concerning the level of consciousness. The high score of 15 would reflect a fully alert, well-oriented person, while a score of 3, the lowest possible score, is indicative of deep coma. A score of 7 or less can be considered to be a generally accepted level for coma, and indicates the need for a standard of nursing care conductive to the requirements of the comatose patient (Hickey, 1981: 110). Based on the GCS, the severity of head injury may be

classified into three categories: head injury patients with a GCS of 8 or less were severe head injury; a GCS score of 9 to 12 were moderate head injury, and those with a GCS score of 13 to 15 were mild head injury (Rimel, et. al., 1990: 13-15).

Defining Mild Head Injury

Mild head injury is a common presentation in emergency departments. However, the definition of mild head injury in the literature has been confusing (Borczuk, 1997: 563). It is defined as a brief loss of consciousness after a blow to the head, whereas other definitions grade the degree of injury by the length of posttraumatic amnesia (Hsiang, et. al., 1997: 234). The generally accepted definition of mild head injury is currently based on GCS score. A patient with a GCS score of 13 to 15, regardless of other clinical features, is classified as having mild head injury (Hickey, 1997: 386; Rimel, et. al., 1990: 13). Although this definition is convenient and reproducible, it is arbitrary and may be misleading. Because of a ceiling effect, a GCS score of 15 does not differentiate a patient with mild head injury from a person who has had no injury. A history of loss of consciousness is helpful in establishing the occurrence of significant head injury, but mild head injury is not always associated with of loss of consciousness (Borczuk, 1997: 564).

The definition for mild head injury put forward by the Head Injury Interdisciplinary Special Interest Group (HI-ISIG) of the American Congress of Rehabilitation Medicine (ACRM) (Borczuk, 1997: 564; Kay, et. al., 1993: 86) indicates that evidence of mild head injury can include not only loss of consciousness, but any particular trauma-induced transient alteration in mental state. Specifically, the ACRM defined mild head injury as a traumatically induced physiologic disruption of the brain function, with at least one of the following: 1) any period of documented loss of consciousness, 2) any loss of memory for events immediately or before the accident, 3) any alteration in mental state at the time of the accident, and 4) focal neurologic deficit, which may or may not be transient.

Williams and colleagues (1990: 422-428) divided mild head injury into uncomplicated and complicated injury according to GCS scores and roentgenographic findings. Patients with uncomplicated mild head injury are those with an initial GCS score between 13 and 15, a normal computerized tomography (CT) scan, and either a

normal skull roentgenogram or an abnormality limited to a linear or basilar skull fracture. On the other hand, patients with complicated mild head injury are those with and initial GCS score of 13 to 15 and roentgenographic evidence of focal brain lesion and / or depressed skull fracture. Comparing between groups found that patients with complicated mild head injury demonstrated more severe neurobehavioral sequelae than those with uncomplicated mild head injury. This study indicates that there is heterogeneity in pathophysiology among patients with GCS scores ranging from 13 to 15, implying that the presently accepted definition of mild head injury is inappropriate (Hsiang, et. al., 1997: 234-235). Some researchers suggest that additional criteria are necessary to establish a more appropriate definition. Levin (1996: 749) summarized that a mild head injury can be defined as an injury caused by blunt trauma and /or sudden acceleration / deceleration which produces a period of unconsciousness for 20 minute or less, a GCS score of 13 to 15, no focal neurological deficit, no intracranial complications, and CT findings limited to a skull fracture without evidence of a contusion or hematoma.

Type of Mild Head Injury

An external mechanical force to the cranium and the intracranial contents initiates the complex anatomic and physiologic abnormalities of head injury. Owing to the low mortality of mild head injury, neuropathologic studies of human with such brain damage are uncommon (Goodman, 1999: 143). Types of injuries after mild head injuries are damage to the scalp, and skull, cerebral contusion and laceration, diffuse brain injury, and intracranial hemorrhage (D'Angelo, 1989: 219-222; Goodman, 1999: 143-150; Katz & Alexander, 1994: 496 - 505; Dumrong Pavilai, B.E.2524).

1. **Damage to the scalp** (Nikas, 1998: 340; Goodman, 1999: 145). The scalp is very prone to profuse hemorrhage as a result of its rich vascular supply and the poor ability of the scalp vessels to vasoconstrict. Blunt trauma to the head often leads to jagged stellate lacerations of the scalp. Fortunately, the scalp is also very resilient, and only the most severe avulsing injuries lead to permanent damage. Nonetheless, mild

head injury can cause scalp damage that scars, leading to entrapment of vessels and nerves and traumatic neuromas that may contribute to the posttraumatic pain.

2. Damage to the skull (Goodman, 1999: 145; D'Angelo, 1989: 220). The skull is the primary structural protector of the brain. Its function is to soften a blow by deforming it and, when forces are sufficiently severe, to fracture, thereby dissipating the energy of the blow. Fractures radiate from the point of impact; if they communicate with the surface of the skin, they are said to be "open"; if not, they are "closed". Linear and basilar skull fractures may occur in mildly injured patients, but basilar fractures usually bespeak higher energy, and therefore more severe injuries. If an extremely high degree of energy is transferred at the impact site, the underlying skull may be pulverized, leading to a comminuted fracture. Depressed skull fractures results from focal injuries of at least moderate severity. Blood and cerebrospinal fluid may seep through skull fractures and drain through the nose and ears. Such cerebrospinal fluid leakage can be the source of recurrent meningitis.

A roentgenogram of the skull can be used to detect a linear or basilar skull fracture in the patients with mild head injury. A study of several thousands of the patients in accident departments and general surgical wards in Scotland (Jennett, 1996b: 7) has shown that a fracture of the skull is a much more powerful predictor of hematoma than is altered consciousness. Multiple investigators (Feuerman, et. al., 1988: 449-453; Shackford, et. al., 1992: 385-394; Teasdale, et. al., 1990: 363-367) have shown that the presence of a skull fracture increases the likelihood of an intracranial hematoma. In a fully conscious and oriented patient, a skull fracture has been shown to increase this risk 3 to 176 times. A retrospective study (Mendelow, et. al., 1982: 1530-1532) found only one intracranial hematoma in 865 alert and oriented mild head injury patients and no skull fracture in those patients who were admitted to the hospital for observation. Because the incidence of intracranial hematoma was higher in patients who had a skull fracture, Shackford and Wald (1999: 157) suggested that skull radiography could be useful in determining which patients should be admitted. Supporting this was a study of 8,406 patients (Teasdale, et. al., 1990: 363-367) in which a skull fracture in an alert and oriented patient without neurologic deficits increased the risk of intracranial hematoma 176 times. The absence of a skull

fracture does not rule out the presence of an intracranial hematoma. Furthermore, detection of a basilar skull fracture often requires the expertise of a radiologist, who may not be immediately available. Thus, plain roentgenography of the skull has little utility in the management of mild head injury (Feuerman, et. al., 1988: 449). Skull fractures in patients with mild head injuries are found a little. A study of 3,370 patients with mild head injuries (Culotta, et. al., 1996: 245-246) found skull fractures at 5.9 %. The percentage of skull fracture in patients with a GCS score of 13,14, and 15 was 18%, 9.8 %, and 3.8 %, respectively.

3. Cerebral contusion and laceration. Contusions are areas of focal cortical injury that result from direct external contact forces or from the brain being slapped against the intracranial surface with acceleration / deceleration trauma (Goodman, 1999:143). Commonly involved sites include the bases of the frontal and anterior temporal lobes. Parasagittal contusions may occur with whiplash injury and result from acceleration / deceleration of the head without direct impact. Cortical contusions are associated with localized ischemia, edema, mass effect, and poorer outcome in mild head injury (Williams, et. al., 1990: 442). Signs of contusion vary with cortical location and may include focal weakness, numbness, incoordination, aphasia, and difficulties with memory and cognition (Kushner, 1998: 1618).

4. Diffuse Brain Injury (DBI). DBI is general brain tissue injury in particular the damage to neuron and axon. The damages are classified in two groups (D'Angelo, 1989: 219; Katz & Alexander, 1994: 499–502; Nakornchai Phuenpathom, B.E.2541): cerebral concussion and diffuse axonal injury.

4.1 Cerebral concussion. It denotes the loss of consciousness without significant anatomic damage to the brain. This brief loss of awareness may be due to rotational stress that temporarily blunts neural activity in the reticular activating system (RAS) of the brain stem. The membrane potential may change due to a breakdown of tight junctions. The severity of the concussion (McNair, 1999: 641) is quantified by the duration of amnesia. The duration of amnesia is the length of amnesia following impact (retrograde amnesia) plus the length of amnesia prior to impact (anterograde amnesia). Observers usually overestimate the duration of

unconsciousness. Therefore, it is helpful to record the time interval between the first and the last thing remembered after and before the accident. A cerebral concussion itself is of little clinical significance; its importance is in the fact that it may be the first warning of more severe neurologic injuries. Patients who sustain a cerebral concussion should consequently be observed for a progressive neurologic deficit. Hospital personnel or reliable family members may do this observation.

4.2 Diffuse Axonal Injury (DAI). Axonal shear injury is the primary pathologic features of head injury of all types (McNair, 1999: 641; Nakornchai Phuenpathom, B.E.2541). It is a consistent finding in mild, moderate, and severe classifications, with the distribution and number of axons involved increasing with worsening severity of injury. Trauma-generated shear forces produce non-uniform strains and distortions within the brain that disrupt axons and small blood vessels, causing axonal injury (Katz & Alexander, 1990: 499 – 502) roughly proportional to the direction and magnitude of the applied traumatic force. Great forces result in structural injury and permanent loss of axonal function, while limited forces yield potentially reversible physiological injury. The extent of axonal injury is suggested by duration of loss of consciousness or of post-traumatic amnesia and the GCS score. Area of axonal shear injury may be indicated on magnetic resonance imaging (MRI) or computed tomography (CT) scans by petechial hemorrhages that result from concomitant disruption of small blood vessels (Kushner, 1998: 1617-1618).

5. Intracranial Hemorrhage (Kushner, 1998: 1618). Epidural, subdural, subarachnoid, or intracerebral hemorrhages may complicate mild head injury. The incidence of neurosurgical complications after mild head injury has been estimated to be between 0.3 % to 4 % (Borczuk, 1997: 569-573). In a meta analysis of four studies (Shackford & Wald, 1999: 157-158) including a total of 6,060 patients with mild head injuries, the likelihood of needing a craniotomy was inversely related to the GCS score: 2.1 % for patients with score of 15 and 8.8 % for those with a score of 13. Intracranial hemorrhages occur less often with mild head injury than with other types of head injury. However, anticoagulant therapy or coagulopathies increase risk.

Neurological deterioration in a patient previously classified with mild head injury is highly suggestive of an evolving intracranial hematoma. It is estimated that in

20 % to 50 % of cases of epidural hemorrhage there is a lucid interval (D'Angelo, 1989: 221) following a brief loss of consciousness or period of confusion prior to neurological deterioration. Epidural hemorrhage may occur secondary to tearing of the middle meningeal artery, middle meningeal vein, or dural sinus and may be acute or subacute in presentation. Subdural hemorrhage occurs when trauma results in tearing of the bridging veins or dura and may be acute, subacute, or chronic in presentation (Jagada, 2000: 356). Chronic subdural hematomas can present clinically months or years after a seemingly trivial head injury and often occur in the elderly (Katz & Alexander, 1990: 505). Manifestations of a chronic subdural hematoma may be mistaken for another disease process, including stroke or progressive dementia.

Subarachnoid hemorrhage (Halliday, 1999: 35), which is more common with severe brain injury,results from bleeding into the cerebrospinal fluid from small vessels torn by forces generated by trauma. Subarachnoid hemorrhage can result in cerebral vasospasm and ischemia The blood can cause meningeal irritation with headache, nuchal rigidity, and photophobia in an otherwise normal patient. Blood in the subarachnoid space can incite fibrosis within the basal cerebrospinal fluid (CSF) cisterns, impeding normal CSF flow. Patients may develop hydrocephalus (Sompong Tongpipat, B.E.2539) several days to several weeks after a head injury. The clinical picture is similar to so-called normal pressure hydrocephalus with the development of mental deterioration, urinary incontinence, and gait dysfunction. Ventriculomegaly is seen on brain scans.

Outcome of Mild Head Injury

Head trauma may be the result to injuries of head and neck structures. Many patients admitted to the hospital are mildly injured which poses a very slight threat to life, and most patients remain in the hospital for a day or two (Levin, 1996: 749-750). Nevertheless, one third or more of them suffer prolong posttraumatic sequelae and many have measurable neuropsychologic deficit (Miller & Jones, 1990: 245). Outcomes of mild head injury that is often problems after injury can be divided in to two groups (Hinnant, 1999: 187-191; Katz & Alexander, 1994: 529- 542; Kraus, 1999: 173- 178; Sompong Tongpipat, B.E.2539): physical problem, and cognitive and behavioral problems.

1. Physical problem

Physical problems of posttraumatic head injury may result from focal lesion in brain or complication from those disabilities (Kushner, 1998: 1620). These problems which usually find on mild head injuries are movement disorders, seizure disorders, speech deficits, and posttraumatic stress disorder (PTSD).

1.1 Movement disorders. They may occur from muscle weakness, or paralysis. The physical examination acutely after mild head injury may reveal focal neurological deficits in 1 to 5 % of patients with transient muscle weakness described in as many as 12.6 % of patients evaluated in an emergency room environment. The persistent of these problems upon initial follow-up in an outpatient clinic environment remains less clear (Gunsett & Mysiw, 1992: 263). In general, focal neurologic deficits are rare, whereas musculoskeletal abnormalities in the form of tender points and trigger points suggestive of fibromyalgia appear to be quite common. Parkinson's disease can follow more severe head trauma or multiple episodes of mild head injury. There was reported that head injury or stress caused by accidents could transiently increase the dysfunction of Parkinson's disease without altering the long-term prognosis (Evans, 1992: 828).

1.2 Seizure disorders. It can be sequelae of all degree of head injury. The risk within 5 years of posttraumatic seizure after mild head injury without a skull fracture in one population study was 0.8 %, which is similar to the general baseline incidence (Katz & Alexander, 1994: 496 – 505). The unusual occurrence, however, of a seizure within a short time period after mild head injury without a depressed skull fracture or contusion certainly raises the possibility of a causal link (Evans, 1992: 829).

1.3 Speech deficits. Communication difficulties are usually due to primary motor or language deficits, depending on the location of the brain damage. Focal left cortical pathology usually results in disorders of language such as dysphonia, dysartria, apraxia (Groher, 1990: 151; Levin, 1987: 458).

1.4 Posttraumatic stress disorders (PTSD). PTSD reportedly occurs in between 17 % and 33 % of individuals after mild head injury and occurs comparably in mild head injury and non-mild head injury populations (Bryant & Harvey, 1999: 302). Symptoms of PTSD involve cognitive, somatic, and affective

components that overlap with postconcussion symptoms. PTSD symptoms (Harvey & Bryant, 1998: 335) may include headaches, dizziness, fatigue, fear, helplessness, irritability, and anxiety, difficulty sleeping, visual disturbance. Symptoms of PTSD sometimes have a delayed onset of months or years after the head injury. Patients may demonstrate some persistent symptoms of PTSD within 3 months after a mild head injury, although they many not meet the full criteria for the diagnosis.

2. Cognitive and behavioral problems

Cognitive and behavioral problems are common after mild head injury. They are often the most disabling sequelae of the injury. Additionally, the functional changes that the follow relatively "mild" head injury are often the most difficult to diagnose and treat. They are explained into two categories (Evan, 1992: 827-828; Zasler, 1999; 128-129) which are cognitive problems, and behavioral disturbance.

2.1 Cognitive problem

Cognitive functioning includes higher-level process (Hinnant, 1999: 187-188) such as abstract thinking, verbal reasoning, and mental calculation. These processes depend upon the person's capacity for perception, attention, memory, and language development. Therefore, cognitive problem can be defined as a deficiency in intellectual functions that depend on basic attention, information-processing ability, language, and memory. Cognitive deficits may subside within 3 months after a relatively mild head injury (Gronwall & Wrightson, 1974: 609-609; Levin, et. al., 1987: 234-243). However, some studies (Middelboe, et. al., 1992: 5-9) have shown a persistence of symptoms beyond one year. A study of 424 patients with mild head injury (Rimel, et. al., 1981: 221-228) found deficits in higher-level cognitive function, novel problem solving, and inattention-concentration are common at 3 months after injury, even though only 2 % of the subjects had focal neurologic deficits. Deficits in cognitive functioning owing to mild head injury include a memory deficit, attention and concentration problems, intellectual deficits, problems in executive functioning, and deficits in perception and communication (Evan, 1992: 835).

2.1.1 Memory deficit. It is a common complaint of those who suffer from mild head injury. In one study (Rimel, et. al., 1981: 223), 59 % of patients with mild head injuries reported memory problems at sometimes after their injury.

Memory loss may be attributable to deficits in attention, concentration, and perception, which lead to faulty initial registration and consolidation of information (Capruso & Levin, 1992: 879). Memory-retrieval problems tend to correlate with specific verbal or, less frequently, most commons and can be very frustrating, leading to increased anxiety and a worsening of symptoms. The individual may paraphrase or confabulate to compensate for the problem. One investigator (Brooks, 1990: 164) noted that, in addition to the problems with information processing, impairment of verbal memory was one of the greatest predictors of unemployment 7 years after injury.

2.1.2 Attention and concentration problems (Hinnant, 1999: 188). Attention deficits may involve problem with sustained, selective, or divided attention; difficulty in shifting between stimuli; or attentional control. Attention-concentration deficits tend to limit the patient's ability to perform well in a stressful environment, such as driving in heavy traffic. Reaction times may be impaired in situations that demand attentional focus and rapid response. Victims of mild head injury usually recover from attention deficits within 6 months, in contrast to those with severe injuries, who may have permanent deficits.

2.1.3 Intellectual deficits (Hinnant, 1999: 188). Mild head injury often spares verbal abilities, and because intelligence tests primarily measure overlearned verbal information. Performance on these tests is often a better indication of premobid functioning than of current deficits. Nonetheless, focal damage to the dominant hemisphere, as well as cultural and educational limitations, can lower the patient's performance on the verbal portion of intelligence tests. Depending heavily on visuospatial abilities and manual manipulation of materials, nonverbal tests of intelligence are far more independent of the patient's educational and cultural background, although age does affect the score. Nonverbal test can reveal perceptual deficits from damage of the non dominant hemisphere, central or peripheral impairment in the use of the upper extremities, and general cognitive or psychomotor slowing.

2.1.4 Problems in executive functioning (Capruso & Levin, 1992: 886; Hinnant, 1999: 188). Executive functions concern the areas of cognition involved in expressing abilities. Executive disorders appear in various forms that may overlap. They can be categorized as follows: 1) volition, including capacities for

awareness of one's self and surrounding and motivational state; 2) planning, including abilities to conceptualize change, be objective, conceive of alternatives and make choices, develop a plan conceptually, and sustain attention; 3) purpose of action, including productivity and self regulation; and 4) performance effectiveness or quality control. For mild injury patients, who otherwise seem to have made a good recovery, deficits in executive functioning can compromise their ability to maintain employment or return to a satisfactory psychosocial status. Executive functions frequently are the most difficult neurobehavioral deficits to treat. Impairments in planning and organization, two of the most common deficits, are best addressed with structured exercises that provide multiple opportunities for initiation, planning, and carrying out of goal-directed activities.

2.1.5 Deficits in perception and communication (Capruso & Levin, 1992: 885-886; Groher, 1990: 151). Some extent perceptual and communication deficits have been addressed already in the discussion of the effects of head injury on complex intellectual tasks. Head injury, which has right focal cortical pathology, usually results in disturbances of perception and visual integration, and diffuse impairment in disturbance of cognition including awareness, attention, memory, abstractive skills, and orientation, of which specific deficits of language and perception are a part. Subtle deficits in language and perceptual functioning are often presented even late after injury.

2.2 Behavioral disturbance

Changes in personality exist on a spectrum with other behavioral problems and can be part of the broader dysfunction (Kraus, 1999: 176), such as a frontal lobe syndrome, cerebral dysrhythmia, or general or general cognitive impairment. In some patients with mild head injury, premobid negative personality traits such as irritability are exaggerated. In more serious cases, families often complain that the patient has become a different person. Personality changes sometimes are caused by damage structures directly responsible for behavior and emotion. Alternatively, cognitive deficits can change the patient's perceptions of themselves or their environment and thereby affect their response to the environment. Common behavioral disturbances after mild head injury include irritability, liability, impulsively, disinhibition, poor

motivation, poor self-regulation, poor judgment and insight, risk taking, sexual disturbances, and aggression (Kraus, 1999: 176). These emotional symptoms may be a source of significant disability and can contribute to the development of the persistent PCS (Lowdon, et. al., 1989: 193-194).

The presence of various symptoms that result from neurological damage, psychological distress, or combination of both compounds adjustment after mild head injury. The cluster of symptoms that often follow mild head injury are generally named that "postconcussion symptoms (PCS)". The symptoms can manifest immediately after injury and persist for a variable period. They fall into several categories, which include physical, mood, behavioral, and cognitive problems. PCS has been estimated to develop in as many as 50 % of victims of mild head injury (Evans, 1992: 817). However, estimates may not be entirely accurate because many people do not seek medical attention for mild head injury. Although most patients with these symptoms seem to recover over time (Levin, et. al., 1987: 234), a significant proportion suffer from persistent difficulties (Kraus, 1999: 175). PCS include symptoms such as headache, dizziness, and difficulty with memory or concentrating, disturbed sleep, irritability, depression, and other symptoms (Borczuk, 1997: 574; Evans, 1996: 593-594).

Posttraumatic headaches are the most common symptom of PCS. They usually resolve over time, though this may be up to a year after the injury. They can be migrainous, tension, or mixed in nature. Little research has been conducted on the cause of posttraumatic headaches, and the role of other variables, such as psychologic factors, is debated. Headaches have been estimated to occur in about 30 % to 90 % of patients who are symptomatic after mild head injury. Paradoxically headaches may occur more often with longer duration in mild head injury patients as compared with more severe degrees of trauma (Evans, 1992: 822). However, it is important to take into account the prevailing level of headaches and other symptoms associated with mild head injury in the general population (Levin, 1996: 752). For example, Dikmen and colleagues (1986: 1227-1231) found that more than one third of uninjured control reported symptom such as headaches, fatigability, and irritability.

The persistent PCS may result from mild head injury or may be related partially or entirely to chronic pain, anxiety, or depression. Interaction between these factors can result in cognitive and emotional disturbances that may have an impact on social relationship, employment, and daily function (Brooks, 1992: 126-129; Kushner, 1998: 1622). Rimel and her colleagues (1981: 221) reported that one-third of patients with mild head injuries still had not been able to return to their previous level of work or student activity 3 months after injury. One study involving 1,216 patients with mild head injuries (Gunsett & Mysiw, 1992: 268) demonstrated that 52 % of patients were back at work within 2 weeks or less of injury. However, 31 % of those previously employed had not successfully returned to work at 6 weeks after injury, and 18 % remained unemployed 3 months after mild head injury.

Recovery after Mild head Injury

Patients with symptoms after mild head injury generally recover over a three-month period (King, et. al., 1995: 558; Levin, 1996: 751). It is in term of ability of perform well on neuropsychological measures and ability to return to work despite the possible persistence of minor symptoms. It has been shown that focal parenchymal lesion on MRI scans of the brain resolve within 1 to 3 months these changes are paralleled by improvement in performances on neuropsychological tests and resumption of previous routine activities (Williams, et. al., 1990: 422). The typical mild head injury patients with a GCS score of 15 in the emergency department and posttraumatic amnesia lasting less than one hour will usually recover in 6 to 12 weeks (Borczuk, 1997: 574; Gronwall & Wrightson, 1974: 607; 1981: 889; Levins, et. al., 1987: 234). Longer recoveries may be expected on older patients and persons with preexisting medical conditions, including psychiatric disorders, alcohol or drug dependency, and previous head injury.

Patients with prolonged loss of consciousness or posttraumatic amnesia may never clear completely (Rimel, et. al., 1981: 221). The patients who are still symptomatic will continue to recover over 3 to 6 months (MacFlynn, et. al., 1984: 1326). Report by one year after the initial injury, 85 to 90 % of patients are able to resume prior responsibilities. Although some may still be susceptible to various degrees of problem when subjected to physiological or psychological stress, and those

returning to demanding vocations may always be aware of limitations in performance (Kushner, 1998: 1622). The 10 % to 15 % of patients who are still symptomatic one year after injury may include those with the persistence of one troubling symptom, varying cluster of symptoms complex. Such individuals are at high risk for emotional and cognitive disabilities that may involve the inability to carry out ordinary daily activities and work responsibilities and to maintain important social relationship.

The Nurse's Role

The management of the patient with head injury involves multiple disciplines to move through the system and to the home. Initial management begins with the physician of the trauma team. After a complete assessment, the patient is then transferred to the service that provides the optimum care for the patient's condition. The patient may remain on the trauma service due to multiple injuries or be treated by the neurosurgical service because of an isolated head or spinal cord injury. Upon admission to the ward, the nursing staff becomes and integral part of the team. Nurses provide bedside more than any other disciplines and are able to assess subtle changes in loss of consciousness or other types of status. The nurse works in collaboration with the medical team to stabilize the patient (McNair, 1999: 655).

The role of the nurse is to assess and interact with patients with mild head injuries to prevent intracranial hemorrhage. The patients are observed for signs of decrease level of consciousness and for the development of abnormal neurologic signs. They undergo sequential neurologic nursing observation, including scoring on the GCS, pupil size and response to light, and comparison of motor power on the left and right sides of the body. In addition, a thorough initial baseline neurologic assessment is necessary. Frequent, serial assessments are necessary to determine trends and to recognize changes such as hemorrhage early. The nurse also has the responsibility of assessment for complications such as cardiac arrhythmia, respiratory disturbance or metabolic disorder (Miller & Jones, 1990: 243). Nurse's important role in caring of patients with mild head injuries is providing information at discharge about problem of mild head injury that could occur (Hinkle, et. al., 1986: 271).

In summary of the reviewed literatures, patients with mild head injuries constitute the overwhelming majority of patient with head injury seen in the emergency department. The subtle deficits of mild head injury across multiple spheres involve physical, cognitive and psychological functioning. They are a large number of symptoms and signs that may occur alone or in combination. They are called that PCS. The patients may appear physically recovered, but they have problems reintegrating into family, work, or school and frequently are thought of as difficult, lazy, somatic, or histrionic. The early identification of patients at risk for chronic behavioral problems after referral and intervention must be initiated as soon as possible. In Thailand, there are several descriptive retrospective studies about epidemiology of patient with head injury (Aroon Kijmahatrakul, B.E.2542; Jaturong Tepahudee & Nakornchai Phuenpathom, B.E.2542; Sakchai Tangchitvittaya, B.E.2542), and nursing studies of family member of patients with severe head injuries (Kanyarat Poungbunhan, B.E.2539; Rumrada Intorn, B.E.2539; Ubonwan Kitirattrakan, B.E.2541), but there is a lack of studies mild head injury with its outcome, as adaptation after mild head injury, and optimal nursing intervention among Thai people. Although this kind of study has been conducted in other countries, it was limited and could not provide generalizations for Thai society. This study aimed to investigate patient's adaptation after mild head injury, from the PCS and behavior in daily living. The results of this study can be used for develop nursing intervention for the patients with mild head injuries.

CHAPTER III
MATERIALS AND METHODS

The purpose of this descriptive study is to investigate adaptation among patients with mild head injuries at the end of the 2nd and the 8th week of injury. The research design, subjects, measurement instrument, and data analysis are presented in this chapter.

The Study Sample

The target population of this study was all the patients who were diagnosed as head injury at the emergency department and neurosurgical wards of Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University. The eligible sample of 60 patients with head injuries were selected according to following criteria: 1) 15-60 years of age at the time of injury; 2) Glasgow Coma Scale score (GCS) of 13 to 15 on admission and through out hospitalization, no evidence of cerebral hemorrhage; 3) no history of significant head injury, alcoholism, mental retardation, and psychiatric disorder (e.g.schizoprenia, manic depressive illness); 4) Thai literacy; and 5) agreed to participate in the study. The exclusion criteria are 1) pregnancy; and 2) subjects with multiple injuries.

A sample size of 60 (25 % of total cases) (Pechnoi Singchangchai, et. al., B.E.2539) was calculated from total cases with mild head injury who were admitted at Maharaj Nakorn Chiang Mai hospital in 1998.

Setting

The study was conducted at Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University, in different four units as follows:

1. Emergency department is a unit that provides primary treatment for patients who have acute health problems. The patients whose conditions need further treatment will be transferred and admitted to wards.

2. Neurosurgical wards consist of Male and Female neurosurgical wards. Male and Female neurosurgical wards are the units for patient who have neurosurgical problem in convalescence stage at the age of 15 years and older.

3. The Traumatic ward is the unit for acute traumatic patients both male and female.

4. The Out Patient Department is the unit for patient to follow up. It is opened regularly for neurosurgical patients on Tuesday.

Instruments

The instruments used in this study were as follows (see Appendix A):

1. the Demographic Questionnaire ;
2. the Glasgow Coma Scale (GCS);
3. the Rivermead Post Concussion Symptoms Questionnaire (RPQ); and
4. the Sickness Impact Profile (SIP) .

The Demographic Questionnaire

The researcher developed a demographic questionnaire for this study, to describe the characteristics of the patients with mild head injuries. It included information about the patient's gender, age, religion, marital status, education level, occupation, household composition, causes of injury, methods of payment, and length of hospital stay.

The Glasgow Coma Scale

Teasdale and Jennett introduced the Glasgow Coma Scale (GCS) in 1974. It was used as a clinical scale for assessment of the level of consciousness after head injury. The GCS consists of three elements of response: eye opening, verbal responsiveness, and motor response (Segatore & Way, 1992: 548). A numerical score is given for appropriate response in each of these three categories. The total score of the three categories ranges from 3 to 15. A score of 13 to 15 indicates near normal

brain function of mild head injury; 9 to 12 represents a moderate severity, and 8 or less indicates severe head injury or coma (Miller, et. al., 1990: 36 - 37).

The GCS was tested for reliability coefficient by groups of experienced nurses, new graduates and student nurses, with results of .94, .94 and .90, respectively (Rowley & Fielding, 1991: 536). The Cronbach's alpha coefficient was .83 to .87 ($p < .0001$) (Segatore & Way, 1992: 550). Juarez and Lyons (1995: 285) tested the interrater reliability of the GCS between nurses and physicians and the Kappa agreement score ranged from .39 to .79 ($p = 0.000$). In addition, Menegazzi and colleague (1993: 46–47) determined the reliability of the GCS when used by emergency physicians and paramedics. They divided the levels of consciousness into three: severe, intermediate, and no or mild alteration in level of consciousness. The Kappa statistic was significant ($p < .0001$) for severe ($k = .48$), intermediate ($k = .34$), and no or mild condition ($k = .85$).

In this study, the level of consciousness of the subjects were collected from medical records, which used the GCS score assessed on their first visit to the emergency room or the wards. The subjects were mild head injuries level, possible scores of GCS in this study ranged from 13 to 15.

The Rivermead Post Concussion Symptoms Questionnaire (RPQ)

The RPQ was developed by the colleagues of Oxford Head Injury Service, Rivermead Rehabilitation Centre, England (King, et. al., 1995: 587-597; Moss, et. al., 1994: 149-156). They developed from their experiences and symptoms previously reported in the literature. The purpose of the RPQ was to assess presentation and severity of postconcussion symptom (PCS) after head injury, specifically among mild head injury patients. It is composed of 16 symptoms and 2 open-ended questions for additional symptoms as part of sequelae of traumatic head injury, which are rated on 0 to 4-point scale to indicate severity of symptom. Experts of centers verified the content of the RPQ and the Oxford Head Injury Service used it in the systematic follow up of head injury patients.

The reliability of the RPQ (King, et. al., 1995: 587-597) was studied in 41 patients with head injury by using the 24 hours test-retest method. The Spearman's rank correlation of the test-retest data yielded a significant ($p < .001$) reliability

coefficient of .91 for the total symptom score. Its inter-rater reliability was examined with 46 patients with head injury with the coefficient of .87 ($p < .001$) for the total symptom scores

For this study, the RPQ was used for assessment of presentation and severity of PCS resulting from head injury that was a stimulus of body system. It was translated into Thai by the researcher and validated by 4 experts: one neurosurgeon, one surgeon, one professional nurse, and one nurse instructor with expertise in neurology. Patients were asked to rate a degree to which 16 PCS were more of a problem compared with premorbid levels, using value from 0 to 4 (0 = not experienced at all, 1 = no more of a problem, 2 = a mild problem, 3 = a moderate problem, 4 = a severe problem). This aimed to overcome the difficulties inherent in the finding that post-concussion-type symptoms are reported by a significant minority of the people who have had no head injury whatsoever. In analysis the score of 0 or 1 were considered as unchanged by the head injury and therefore calculated as 0. Adding the score of symptom which was rates as 2, 3, or 4 . Subjects for problems relating to orthopedic injuries rather than to the head injury itself commonly used the additional symptom section of the RPQ. This section was therefore not included in the total score (King, et. al., 1995: 588). Adding score in the way described was used to give a crude indication of the total problems. The change score was calculated by subtracting the scores at the first assessment, for each subject. Possible scores of the frequency scale range from 0 to 64. Higher scores of frequency indicate more severe problems of patients with mild head injuries or more ineffective behavior.

The researcher conducted a study to assess the reliability of the RPQ in 15 samples, by computing the Cronbach's alpha coefficient, and found that it was .89. When this tool was used with 60 subjects in this study, the Cronbach's alpha coefficient was .90 and .94 for the total scores at the 2nd and the 8th week after injury, respectively.

The Sickness Impact Profile (SIP)

The SIP was developed by Bergner and an interdisciplinary team at the University of Washington (Bergner, et. al., 1976: 87- 97; 1981: 787-805; Gilson, et. al., 1975: 1304-1310). The purpose of the development was to provide a measure of

perceived health status that is sensitive enough to detect changes or differences in health status that occur over time or between groups. It was developed based on a conceptual model of sickness as manifested changes in behavior associated with carry out one's daily life activities. The SIP consists of 136 statements in 12 categories. The 12 categories are sleep and rest, eating, working, home management, recreation and pastimes, ambulation, mobility, body care and movement, social interaction, alertness behavior, emotional behavior, and communication. These categories were aggregated into physical dimension and psychosocial dimension by Bergner and coworkers (1981: 789) and revised by Charlton and coworkers (1983: 297-299). These categories are consistent with Roy adaptation model: Physical and Psychosocial adaptation. Physical adaptation consists of ambulation, mobility, body care movement, sleep and rest, and eating, whereas psychosocial adaptation consists of social interaction, alertness behavior, emotional behavior, communication, recreation and pastimes, home management, and work. The higher score in each item from each subjects response to the SIP statement indicate greater dysfunction.

Content validity of the SIP was measured by agreement of 246 subjects, which include outpatients, inpatients, home care patients, and non-patients. The SIP score was tested the correlation with criterion variables. The over all SIP score has correlation of .73, .68, and .49 with patient self-assessments of dysfunction, the National Health Interview Survey index, and clinician assessment of dysfunction, respectively (Damiano, 1996: 349). Temkin and coworkers (1988: 47-56) examined the relationship between the SIP and the GCS on 102 patients with head injury. The higher score on the SIP indicate greater dysfunction, whereas the maximum GCS score indicate alert and fully responsive patient, and lower scores represent deeper coma. There was a statistically significant negative relationships between the total SIP score and GCS score at one month and one year after injury ($r = -.40$ and $-.42$, respectively). Therefore patients with a high scores on GCS had low SIP scores. Furthermore, the SIP discriminate patients with head injuries from a control group with 91% accuracy at one month after injury and 78 % accuracy at 1 year after injury.

Reliability of the SIP (Bergner, 1987: 86-87) was studied in 278 subjects from outpatients, inpatients, and normal people who were not ill at the time by using the 24 hours test-retest method. Test-retest reliability correlation has been reported as .97 for

the interview administered SIP and .87 for the self-administered version. Internal consistency as measure by Cronbach's coefficient alpha of total SIP score has been reported between .93 and .96, and it was tested with a mail - delivered self-administration, with a result of .81 . Temkin and coworkers (1988: 47) used the SIP with 102 head-injured patients and found that the total alpha reliability coefficient was .93 at one month and one year after injury respectively.

In Thailand, Somjit Puengwongsamran (B.E.2541) and Penroong Polkanchanakorn (B.E.2541) translated the SIP into Thai version. Five experts evaluated its content validity. They tested its internal consistency with 35 patients with coronary artery disease before and after coronary stent implantation, and 35 coronary patients before and after percutaneous transluminant coronary angioplasty. The alpha reliability coefficient were .74 to .95 .

In this study, the SIP was used for measuring the impact of head injury on the ability to perform activities of daily living. The SIP items describe activities associated with daily life, each item is the present tense. The patients were asked to endorse those items that they were sure to describe them on that day and that are related to their health. The SIP is scored according to the number and type of items that are endorsed. Each item has a numeric scale value that reflects its degree of dysfunction. Higher scale values indicate more behavior problems or more ineffective adaptation of mild head injury patients. An individual's total SIP score is computed by summing the scale value for the items that he endorses, divided by the total possible scale value of 1003, and multiplied by 100 . The score is expressed as a percent and ranges from 0 to 100. Zero represents no problem or adaptive behavior, and 100 represents maximal ineffective adaptation.

The score for each category is calculated by adding the scale values for each item checked within the category and divided by the maximum possible dysfunction score for that category and multiplied by 100 . The SIP scale values are coded to one decimal as follows:

1. following the checking line for each item, the item number and scale value are shown, such as 078 - 083 indicates item 78 has a scale value of 8.3;

2. following each category code in the upper right-hand corner of the page, the total possible scale value for that category is shown, such as SR - 0499 indicates a total possible scale value of 49.9 for category SR .

The researcher conducted a study to assess the reliability of the SIP in 16 patients with mild head injuries at the 2nd week after injury, and found that the Cronbach's alpha coefficient of total SIP score was .85 . When this tool was used in this study with 60 subjects at the 2nd and the 8th week after injury, the Cronbach's alpha coefficient was .88 and .91, respectively.

Protection of Human Subjects

All eligible subjects were approached to participate in the study. The researcher explained the study objectives, the data collection processes and the subject's right to participate. The subjects who agreed to participate were informed and assured that the data would be kept confidential and reported as group data (see Appendix B).

Data Collection

After permission was secured from the Faculty of Graduate Studies, Mahidol University, the researcher submitted the document for permission in collecting data to the dean of the Faculty of Medicine, Chiang Mai University. After approval, the researcher started to collect data based on these procedures:

1. Screening for eligible subjects based on the inclusion criteria.

2. All eligible subjects were approached. Before the data had been collected, the researcher explained the followings to the subject: the study objectives, the data collection processes, and the subject's right to participate or not. Verbal agreement was considered as the subject consent to participate in this study.

3. Prior to discharge from the hospital, demographic data of each subject who gave consent to participate in the study was collected. The subjects were asked to complete the two self-report questionnaires (the SIP and the RPQ) at home or Outpatient Department on the 2nd and the 8th week after injury. Home address and telephone number were recorded for the contact purpose after discharge. During this

procedure, the researcher spent sometime building rapport with the patients in order to keep good relationship with them for follow up contact.

4. On the 2nd week after injury, subjects who came to follow up at the Outpatient Department, they were enabled to complete the questionnaires by themselves or were structured-interviewed by the researcher with the RPQ and followed by the SIP. Subjects who lost their follow up or who were not offered follow up, they were followed by mailed questionnaires. On the 8th week after injury, all subjects were followed by mailed questionnaires. If the questionnaires were not returned within seven days, the questionnaires were mailed again. Subject, who had the telephone number, would be called from the researcher to remind of completing the questionnaires. Later on, if the questionnaires were still not returned, they would be excluded from the study.

Data Analysis

Data were analyzed by using SPSS for Windows program.

1. Demographic data were analyzed with descriptive statistics: number, percentage, range, mean, and standard deviation.

2. The RPQ and the SIP at the 2nd and the 8th week after injury were analyzed by descriptive statistics: mean, standard deviation, range number, and percentage.

3. The RPQ score at the 2nd week after injury was compared with the RPQ score at the 8th week after injury by using Wilcoxon Match Paired Sign Rank Test.

4. The SIP score at the 2nd week after injury was compared with the SIP score at the 8th week after injury by using Wilcoxon Match Paired Sign Rank Test.

CHAPTER IV
RESULTS

This chapter, the results of data analysis will be presented. The sample characteristics were presented first, followed by the results of adaptation after mild head injury (both postconcussion symptoms and behavior on daily living), and then the results of research hypotheses testing.

Description of Sample

The sample of this study was the patients with mild head injuries who visited the emergency room, Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University. Sixty-two patients were approached. Two patients were excluded because one had GCS score below 13, and one had brain computed tomographic scan showing epidural hematoma. A remainder of 60 patients was included in this study. Of the 60 patients, 42 who were observed at least six hours in the emergency department, were allowed to go back home, and 18 were admitted to traumatic ward or neurosurgical wards. Only six patients came to follow up at the Out Patient Department at the 2nd week after the injury, the rest were followed by mailed questionnaires and they mailed the questionnaires back within 7 days. All patients were followed at the 8th week by mailed questionnaires. The questionnaires of 14 patients were not returned within 7 days. Therefore, the questionnaires were mailed again and 11 had telephone contact. Finally, 60 mailed back the completed questionnaires.

As presented in Table 1, among the 60 patients with mild head injuries, 31 (51.7%) were male, and 29 (48.3 %) were female. The mean age was 29.9 years (S.D. = 10.86) with a range from 16 to 58 years. Majorities of them were 16 to 34 years (66.7 %) and Buddhist (91.7 %). More than a half (53.3 %) were single, 43 (71.7 %) lived with

Table 1. Patient with Mild Head Injury Demography (n = 60)

Variables	Number	Percent
Gender:		
Male	31	51.7
Female	29	48.3
Age (year)		
15 - 24	26	43.3
25 - 34	14	23.3
35 - 44	12	20.0
45 – 54	7	11.7
> 54	1	1.7
Mean = 29.9, S.D. = 10.86, min = 16, max = 58		
Religion:		
Buddhist	55	91.7
Christian	5	8.3
Marital status:		
Single	32	53.3
Married	24	40.0
Widow / Divorced / Separated	4	6.7
Household:		
Family	43	71.7
Relatives	4	6.6
Lived alone / Friends	13	21.7
Home Address:		
Chiang Mai	54	90.0
Other provinces	6	10.0
Education level:		
Primary school	18	30.0
Secondary school	23	38.3
Diploma	10	16.7
Bachelor degree	8	13.3
Master degree	1	1.7
Occupation:		
Government officer	7	11.7
Business owner	1	1.7
Agriculturist	7	11.7
Employee	30	50.0
Student	14	23.2
Unemployed	1	1.7

Table 1 (Continued) Patient with Mild Head Injury Demography (n = 60)

Variables	Number	Percent
Cause of injury:		
Motorcycle accident	45	75.0
With helmet	5	11.1
Without helmet	40	88.9
Car accident	5	8.3
Bicycle / walk	5	8.3
Fall	2	3.4
Assault	3	5.0
Admitted to hospital:		
No	42	70.0
Yes	18	30.0
LOS(days): Range = 1-9, Mean = 3.9, Mode = 1		
Hospital payment:		
Government reimbursement	10	16.7
Self paid	28	46.7
Social security	11	18.3
Social welfare	5	8.3
Others	6	10.0
Admission Glasgow Coma Score:		
13	5	8.3
14	9	15.0
15	46	76.7

their family, and 54 (90 %) lived in Chiang Mai. The majority of them finished secondary school. Seventy-five percents of the injury were from a motorcycle accident, and 88.9 % of them (N=40) were not wearing helmet. Around 77 % of the patients had a GCS of 15, 15 % had a GCS of 14, and the rest had a GCS of 13. After that all the patients had a GCS of 15 on the discharge day. Length of hospital stay of inpatients ranged from one to nine days, with a mode of one day and mean of 3.9 days. Nearly a half of the patients (46.7 %) paid for treatment by themselves.

Adaptation after Mild Head Injury

Adaptation after mild head injury is the manifest behaviors, which involved both physiological and psychosocial behaviors. These behaviors were evaluated from Postconcussion symptoms (PCS) and behaviors in daily living.

Postconcussion symptoms

PCS is a cluster of symptoms experienced by patients after mild head injuries. The Rivermead Post Concussion Symptoms Questionnaire (RPQ) was used to classified PCS at the 2nd and the 8th week after injury. The RPQ composed of 16 items (symptoms) as shown in Table 2. The results from this study revealed that the top three symptoms at the 2nd week after mild head injury involved headaches (63.33 %), dizziness (51.67 %), and being irritable (50 %), whereas being irritable (43.33 %), poor memory (38.33 %), and sleep disturbance (35 %) and taking longer to think (35 %) were the top four symptoms at the 8th week after injury. The least symptom at the 2nd and the 8th week after mild head injury were nausea (3.33 % and 1.67 %, respectively). From total PCS score, at the 2nd week after injury, more than 83 % of all the patients reported at least one symptom, whereas at the 8th week after injury less than 62 % of all the patients reported at least one symptom.

Table 2. Number and percentage of PCS at the 2nd and the 8th week after mild head injury (n = 60)

Patients with symptom	Time after injury			
	The 2nd week		The 8th week	
	Number	percent	Number	percent
1. Headache	38	63.33	13	21.67
2. Dizziness	31	51.67	19	31.67
3. Being irritable, easily angered	30	50.00	26	43.33
4. Forgetfulness, poor memory	28	46.67	23	38.33
5. Sleep disturbance	24	40.00	21	35.00
6. Poor concentration	24	40.00	18	30.00
7. Taking longer to think	24	40.00	21	35.00
8. Noise sensitivity, easily upset by loud noise	23	38.33	18	30.00
9. Fatigue	22	36.67	18	30.00
10. Feeling depressed or tearful	20	33.33	8	13.33
11. Feeling frustrated or impatient	19	31.67	15	25.00
12. Restlessness	16	26.67	17	28.33
13. Light sensitivity, easily upset by bright light	12	20.00	10	16.67
14. Blurred vision	11	11.83	10	16.67
15. Double vision	7	11.67	8	13.33
16. Nausea and/or vomiting	2	3.33	1	1.67
Total PCS score	**50**	**83.30**	**37**	**61.70**

Table 3. Number of improvement of PCS at the 8th week after mild head injury (n = 60)

Patients with symptom	Improvement of symptom			No symptom
	Improved	Worse	No improve	
1. Headache	29	2	7	22
2. Dizziness	20	6	8	26
3. Forgetfulness, poor memory	20	8	5	27
4. Sleep disturbance	20	12	2	26
5. Being irritable, easily angered	17	8	11	24
6. Poor concentration	15	8	6	31
7. Taking longer think	15	10	5	30
8. Feeling depressed or tearful	13	3	5	39
9. Noise sensitivity, easily upset by loud noise	12	9	7	32
10. Feeling frustrated or impatient	11	5	8	36
11. Fatigue, tiring more easily	10	9	8	33
12. Restlessness	10	8	6	36
13. Light sensitivity, easily upset by bright light	8	7	2	43
14. Blurred vision	8	6	2	44
15. Double vision	5	6	1	48
16. Nausea and/or vomiting	2	1	0	57
Total PCS score	**34**	**16**	**2**	**8**

Table 3 shows how many patients with mild head injuries had improved, worsened, stayed the same at the 8th week follow up. Also shown is how many patients with mild head injuries reported no symptoms at either assessment (rated items as 0 or 1). The symptoms, which had improved in most of the patients between the 2nd and the 8th week after mild head injury, were headaches (n = 29), sleep disturbance (n = 20), dizziness (n=20), and poor memory (n = 20). The symptoms, which had worsened in most of the patients at the 8th week, were sleep disturbance (n = 12), taking longer to think (n = 10), fatigue (n = 9), and noise sensitivity (n = 9). Total PCS score were taken as the sum of all symptom scores. Eight of the patients (13.33 %) had no symptom at both periods after injury. Sixteen of the patients (26.67%) were found to have worse total symptoms at the 8th week after injury. Two of the patients (3.33 %) remained the same, and 34 patients (56.67 %) were improved**.**

Table 4. Ranges, Means, and Standard Deviations of total the PCS score at the 2nd and the 8th week after injury (n=60)

Time after injury (week)	Total PCS score		
	Range	Mean	S.D.
2nd	0-46	14.78	13.26
8th	0-52	11.03	13.88

Total possible RPQ scores ranged from zero (best) to 64 (worst). Total PCS score for the patients as shown in Table 4 ranged from 0 to 46 with a mean of 14.78 (S.D. 13.26) at the 2nd week after injury, and 0-52 with a mean of 11.03 (S.D. 13.88) at the 8th week after injury.

Behavior in daily living

The SIP assesses the impact of injury on changing daily activities and behaviors. The SIP consists of 132 items grouped into 12 categories. The score for each category is calculated by adding the scale value of each answered item within the category, dividing by the total maximum possible dysfunction score for the category then multiplying by 100 to produce a percentage of disruption score. The overall score for the SIP is calculated by adding the scale values for each item checked across all categories and dividing by the total maximum possible dysfunction score for the SIP then multiplying by 100 to obtain the overall SIP score. The higher score indicated greater dysfunction or more ineffective adaptation.

Behaviors in daily living were functional status after mild head injury. The SIP classified behavior in daily living of patients with mild head injury at the 2nd and the 8th week after injury as shown in Table 5. In this study, the three highest mean scores of category of the SIP, which indicated poorer adaptation, at the 2nd week after mild head injury were work, sleep and rest, and emotion behavior, whereas at the 8th week after injury, there were alertness behaviors, sleep and rest, and emotion behavior. The least mean scores of the SIP, both at the 2nd and the 8th week after injury were ambulation, body care and movement, and eating. Mean scores of each category of the SIP at the 8th week, except "alertness behaviors" and "communication" lessened from the 2nd week. At the 8th week after injury, the patients had mean score of alertness behaviors higher than the 2nd week. The mean score of communication at the 2nd and the 8th week after injury were equal.

Table 5. Means and Standard deviations of the SIP scores at the 2nd and the 8th week after mild head injury (n = 60)

SIP	The 2nd week		The 8th week	
	Mean	S.D.	Mean	S.D.
1. Ambulation	5.10	9.74	0.90	2.75
2. Mobility	13.73	16.83	6.21	14.13
3. Body care and movement	5.92	11.66	1.69	4.15
4. Sleep and rest	28.31	23.58	22.34	23.49
5. Eating	6.51	10.94	3.48	8.31
6. Social interaction	17.45	18.90	16.64	21.73
7. Alertness behavior	23.29	27.03	24.85	29.55
8. Emotion behavior	24.67	22.13	21.21	23.11
9. Communication	10.03	17.11	10.03	17.61
10. Recreation and pastime	22.04	25.27	14.63	21.32
11. Household management	15.99	21.62	6.69	12.93
12. Work	30.15	29.55	18.60	26.66

Table 6. Ranges, Means, and Standard Deviations of total the SIP score at the 2nd and the 8th week after injury (n=60)

Time after injury (week)	Total the SIP score		
	Range	Mean	S.D.
2nd	0-52.55	14.80	12.56
8th	0-40.95	11.29	12.05

As shown in Table 6, total SIP scores of the sample ranged from 0 to 52.55 with a mean of 14.80 (S.D.= 12.56) at the 2nd week after injury, and ranged from 0 to 40.95 with

a mean of 11.29 (S.D. = 12.05) at the 8th week after injury. Seven of the patients (11.67%) had total SIP scores of zero both at the first and the second assessment. At the 8th week after injury, fourteen of the patients (23.33 %) had total SIP score higher than the 2nd week, indicated worse. Thirty-nine of the patients (65 %) had total SIP score lower than the 2nd week, indicated improvement or recover from the 2nd week after injury.

Hypotheses Testing

Hypothesis 1. Postconcussion symptoms of the patients with mild head injuries at the 2nd week after injury are different from the 8th week after injury.

Hypothesis 2. Behaviors in daily living of the patients with mild head injuries at the 2nd week after injury are different from the 8th week after injury.

The RPQ and the SIP scores were tested for normality by Komogorov-Sminov method. They were not normal distribution. Therefore, Wilcoxon Match Paired Sign Rank test was used for hypotheses testing.

Table 7. Comparison of PCS between the 2nd and the 8th week after mild head injury by Wilcoxon Match Paired Sign Rank Test (n = 60)

Time after injury (week)	Total PCS score		Z	p
	Range	Median		
2nd	0 - 46	10.00	-2.835	< .01
8th	0 - 52	4.50		

The Wilcoxon Match Paired Sign Rank Test as presented in Table 7 showed statistically significant ($p < 0.1$) differences in the PCS of the patients with mild head injuries between the 2nd and the 8th week after injury. Therefore, the result of hypothesis testing is supported. The mean score of RPQ at the 8th week is less than the score at the 2nd week after mild head injury.

Table 8. Comparison of the total SIP score between the 2nd and the 8th week after mild head injury by Wilcoxon Match Paired Sign Rank Test (n = 60)

Time after injury (week)	Total SIP score		Z	p
	Range	Median		
2nd	0 -52.29	12.16	-3.01	< .01
8th	0–40.95	6.67		

The Wilcoxon Match Paired Sign Rank Test as presented in Table 8 showed statistically significant ($p < 0.1$) differences in the total SIP score of the patients with mild head injuries between the 2nd and the 8th week after injury. As such, the research hypothesis was supported. The mean SIP score at the 8th week is lower than the 2nd week after mild head injury.

CHAPTER V
DISCUSSION

This study focused on patients' adaptation after mild head injury. The differences of adaptation between at the 2nd and the 8th week after injury were studied. The adaptation was determined by using PCS and behavior in daily living.

Characteristics of Sample

The results of this study were found that more than a half of the subjects age between 15 and 34 years and a mean age of 29.9 years. This result was similar to the study of Kraus and Nourjah (1988: 1641), and a report of Torner and coworkers (1999: 15). They reported that almost all of mild head injury cases in the United States occurred between the age of 15 and 34 years. Unlike mild head injury in these reports, of which 75 % were male, female and male in this study were equally like to sustain head injury. This excess risk is found not only for mild head injury, but also severe and moderate head injuries as well. The study of Kanyarat Poungbunhan (B.E.2539) found that moderate and severe head injuries occurred in male more than female with an age range of 15 and 34 (62 %) years. This age group might be vigorous ages, which is vulnerable to accident. About 76 % to 87 % of traumatic injury patients were caused by motorcycle accident, and 88.9 % of them were not wearing helmet. About two-thirds of these mild head injury subjects were caused by motorcycle accident which was similar to injury surveillance report of Thailand in 2000 (Chammiparn Santikarn, et. al., B.E.2545a). Risk factors of motorcyclists, which lead to traumatic injury, are alcohol consumption while driving and not wearing a helmet (Perrin & Wilkins, 1996: 528; Chammiparn Santikarn, et. al., B.E.2545b; B.E.2545 c). All parts of Thailand except Bangkok, about 73 % to 100 % of all injured motorcyclists were not wearing a helmet (Chammiparn Santikarn, et.al., B.E.2545 c). This reflects current preventive measures in these regions have been ineffective. About 70% of all mild head injuries

patients in this study visited hospital but were not admitted. They merely had been assessed and observed at the emergency room and then they returned home. However, they were advised to come back to the hospital if they had severe headaches, nausea or vomiting. This is very similar to a report of Jennett (1996a: 366) which reported that in the United State, 82 % of patients with mild head injuries who seek medical attention at the hospital were not admitted. Although some of the patient was admitted to hospital, most of them stayed only one day. So far, there have been no reports available especially in Thailand show the conditions of this group of patients after got mild head injury. Sa-ngaunsin Ratanalert (B.E.2539) said that patients with head injuries with GCS score of 13, 14 and 15, or they are called minor head injury often received a little attention. This might be due to the problem on mild head injury is not life threatening. In this study, about 75 % of the patients had GCS score of 15, and least of all patients with mild head injuries had GCS score of 13. This finding is similar with Kraus (1988: 1640), Hsiang and coworkers (1997: 235).

Adaptation after mild head injury

Findings indicate that 87 % of patients with mild head injuries included in this study develop posttraumatic symptoms. This is similar to studies conducted in Australia, the United States of America, England, and Finland (Landy, 1998: 200-201; Mahon & Elger, 1989: 384; Moss, et.al., 1994: 153-154; Savola & Hillbom, 2003: 175). The result of this study shows that various symptoms following mild head injury may occur with both inpatients who were admitted to hospital and outpatients who were discharged from the emergency room. The most frequently reported symptoms were headache dizziness. Similar findings have been reported by other investigators (Mclean, et. al., 1984: 397; Rimel, et. al., 1981: 221). King and coworker (1995: 242) reported headaches is the second most common symptom 7-10 days after injury, but it was ranked as number 12 at 6 months. Interestingly, our finding of headache as the most common symptom at 2nd week, whereas at the 8th week after injury it was ranked as number 7

PCS following mild head injury of the subjects in this study includes both physical, and cognitive and behavioral symptoms. Majority of the patients at the 2nd week after injury had headache and dizziness (which were physical symptoms) more

than being irritable or easily anger (which was cognitive and behavioral symptoms). It can be explained that occurrence of mild head injury has direct impact on body system then continually effect to cognitive and behavioral functioning. Thus, physical outcome is predominance, however, the etiology of various symptoms following mild head injury is a controversial issue (D'Angelo, 1989: 225; Kushner, 1998: 1620; Savola & Hillbom, 2003: 175). However, cognitive and emotional problems (Katz & Alexander, 1994: 501) may be due to rotational stress that temporarily blunts neural activity in the reticular activating system (RAS) of the brain stem. The membrane potential may change due to a breakdown of tight junctions. Gronwell and Wrightson (1974) reported that majority of patients with mild head injuries recovered from their injury within 35 to 54 days. This study found that about 61% of all patients still have PCS at the 8th week after mild head injury. In most cases, they had more psychological symptoms or cognitive impairments; irritability, poor memory than physical symptoms; dizziness, headache. This might be due to physical symptoms can recover better than cognitive symptoms . Comparison of PCS between the 2nd and the 8th week after mild head injury found that the patient had recovery but did not return to the formal level yet. It was found that 16 patients (26.67 %) had poor symptoms at the 8th week after injury. PCS can disrupt the ability to function at home and at work (Kraus, 1999: 175). The result of this study clearly indicates that most of head injury subjects are experiencing dysfunction on daily living at the 2nd and the 8th week after injury. Most notable are the limitation at work, sleep and rest, alertness behavior, and emotional behavior. This finding was observed by the SIP. The findings are also consistent with finding from the other investigations (McLean, et. al., 1984: 395-397; McLean, et. al., 1993: 1043; Rimel, et.al., 1981: 221-226).

At the 2nd and the 8th week after injury, the head injury subjects reported problems ranging from those involving physical function to those involving disruption of role activities (e.g. work, home management), as well as leisure activities. However, physical functions related to ambulation, body care and movement, eating, and mobility are relatively less affected than major role activities or cognitive functions. This finding is consistent with general finding in the literatures. The result further revealed that even though the subjects perceived that they had significantly improved from dysfunction on daily living over the eight-week period, the improvement was

greater than other in the physical areas. This recovery pattern resulted in persistent difficulties more of cognitive and behavioral symptoms than a physical nature. These results indicate that cognitive and behavioral problems may need more time to recover (McLean, et. al., 1993: 1045). Although at the 8th week after mild head injury may not represent a stabilized period, there is a strong need to collect data at various stages to provide more information that can be used in treatment, prediction, and understanding recovery after head injury.

Most of all subjects reported problems with adaptation after mild head injury both PCS and behavior in daily living. This finding supports careful consideration must be giving to somatic, neurological, neuropsychological, emotional motivation and social factors that alone or together may contribute to a patient' s disability. Early intervention should be directed at evaluation and treatment of somatic complaints, and there should be documentation of baseline finding, including cognitive and emotional state. Patients and families should be educated at the first visit regarding rationale for treatments and expectations regarding outcome (Hinkle, et. al., 1986: 270; Keller, et. al., 2000: 761; Ponsford, et. al., 2002:330).

Limitations of study

The subjects were purposively selected from patients with mild head injuries who attended to the emergency department at Maharaj Nakorn Chiang Mai. It can not be generalized to the mild head injury patients in other hospitals.

CHAPTER VI
CONCLUSION

In this chapter, the conclusion of the study will be presented. The implication and recommendation of the results in nursing practice, nursing education and for further research are described.

Conclusion

This descriptive study aimed to investigate adaptation after mild head injury and compare adaptation with regard to postconcussion symptoms (PCS) and behavior in daily living between the 2nd and the 8th week after injury. The sample comprised 60 patients with mild head injuries who were allocated to hospital or to discharge from the emergency room of Maharaj Nakorn Chiang Mai hospital, Faculty of Medicine, Chiang Mai University. Data were collected in a five-month period. The sample were selected based on inclusion criteria: 1) 15 - 60 years of age at the time of injury; 2) Glasgow Coma Scale score (GCS) of 13 to 15 on admission and through out hospitalization, no evidence of cerebral hemorrhage; 3) no history of significant head injury, alcoholism, mental retardation, and psychiatric disorder (e.g.schizoprenia, manic depressive illness); 4) Thai literacy; and 5) agreed to participate in the study.

The instruments used in this study were Demographic Recording Form, the RPQ and the SIP. The RPQ was used to measure PCS. The RPQ was translated into Thai by the researcher. Content validity of the RPQ was done by four experts and reliability obtained by Cronbach' s coefficient alpha was .90 at the 2nd week after injury, and .94 at the 8th week after injury. The SIP was used to measure behavior on daily living. Somjit Puengwongsamran (B.E.2541) and Penroong Polkanchanakorn (B.E.2541) translated the SIP into Thai. The reliability of the SIP in this study used Cronbach' s coefficient alpha was .88 at the 2nd week after injury, and .91 at the 8th week after injury. Data were collected by patient self-administration, and interviewing

by the researcher. Data analysis was carried out with SPSS for window program.

Sixty patients were included in this study. The patients comprised 31 males and 29 females with a mean age of 29.9 years. More than a half (53.3 %) of the sample in this study were single, 90 % lived in Chiang Mai and most of the subjects were Buddhist (91.7%). More than one-third had finished secondary school and about half of them were employee. About 75% of the study subjects had injuries by motorcycle and 88.9 % of them were not wearing helmet. Around 77 % of the patients had a GCS of 15, 15 % had a GCS of 14, and the rest had a GCS of 13 when admission and GCS of 15 at the hospital discharge. Only 18 patients had to admit for the length of hospital stay 1-9 days (mode 1, mean 3.9). Twenty-eight subjects (46.7 %) paid for treatment by themselves.

The results of this study revealed that:

1. The patient's adaptation at the 2nd and the 8th week after mild head injury in terms of postconcussion symptoms and behavior in daily living as follow

1.1 At the 2nd week after injury, 50 subjects (83.30 %) reported PCS. Mean total PCS score of all subjects were 14.78.

1.2 At the 8th week after injury, 37 subjects (61.70 %) reported PCS. Mean total PCS score of all subjects were 11.03.

1.3 Daily activities were reduced after mild head injury. At the 2nd and the 8th week after injury mean total SIP scores were 14.80, and 11.29, respectively.

2. Comparison of the PCS among patients with mild head injuries between the 2nd and the 8th week after injury showed statistically significant differences ($p < .05$). The score of RPQ at the 8th week is less than the score at the 2nd week after injury.

3. Comparison of the behavioral impact of mild head injury in daily living between the 2nd and the 8th week after injury showed statistically significant differences ($p < .05$). The SIP score at the 8th week is less than the score at the 2nd week after injury.

As a result, the stated hypothesis "patients with mild head injury have different adaptation level with regard to PCS and behavior in daily living between the 2nd and the 8th week after injury" were supported.

Implication and recommendation

The findings of this study provide considerations for nursing practice, nursing education, and further research.

Nursing practice

In this study, all subjects were not offered follow up at OPD, but some subjects still had physical and cognitive and behavioral problems at the 8th week after injury. Therefore, nurses who work at the clinic should provide a follow up by mailed or telephone. And if they still need professional help, the patients could return to follow up again. Moreover, this study found that cognitive and behavioral problems can improve later than physical problem. Therefore, nurses can provide care and counseling service for enhancing the patients recover. Information of this study will be helpful for nurses and other health care providers in planning appropriate and effective intervention to prevent and manage problems after injury and to promote effective of patient's adaptation. Furthermore health care team should set up service systems for follow up this group of patients.

Nursing education

Inservice education should provide training courses of cognitive-behavioral therapy and counselling method for staff nurses who work in neurological wards, to develop their knowledge and skill in caring for the patient with mild head injury.

Further research

To further clarify adaptation of mild head injury patients, the study should be repeated with a larger, random sample in order to permit a more extensive analysis of the variables affecting overall adaptation. The study should also be repeated across time to evaluate adaptation of mild head injury patient at one day, 3 months, and 6 months after injury to evaluate changes in adaptation throughout the recovery process. The patients should be studied in other setting. Future studies in also need to focus on effective interventions for patients with sequelae from mild head injury.

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APPENDIX A

APPENDIX A

Instruments

แบบบันทึกข้อมูลเกี่ยวกับการรักษา

ผู้ป่วยรายที่……. HN…….. วันที่รับไว้ในโรงพยาบาล……...

คะแนนกลาสโกว์		วันแรกรับ	วันจำหน่าย
การลืมตา			
ลืมตาเอง	4	☐	☐
ลืมตาเมื่อเรียก	3	☐	☐
⋮	⋮	⋮	⋮
เกร็งเหยียดแขนบิดออกเมื่อเจ็บ	2	☐	☐
ไม่เคลื่อนไหวเลย	1	☐	☐
คะแนนรวม		…….	…….

ภาพถ่ายทางรังสีของกะโหลกศีรษะ(skull film)

☐ ไม่มี ☐ มี ผล…….

เอกซเรย์คอมพิวเตอร์ (CT-scan)

☐ ไม่มี ☐ มี ผล…….

วันที่จำหน่ายออกจากโรงพยาบาล……..รวมระยะเวลาที่อยู่โรงพยาบาล……วันที่อยู่ปัจจุบัน

โทรศัพท์ที่ติดต่อได้

แบบสอบถามข้อมูลส่วนบุคคล

คำชี้แจง กรุณาตอบแบบสอบถามเกี่ยวกับตัวท่านโดยทำเครื่องหมายวงกลม (□) ล้อมรอบตัวเลขหน้าข้อความที่ตรงกับท่าน หรือเติมข้อความลงในช่องว่าง

1. เพศ
   1. ชาย 2. หญิง
2. อายุ…….ปี
3. ศาสนาที่นับถือ
   1. พุทธ 2. คริสต์ 3. อิสลาม 4. อื่นๆโปรดระบุ……..
4. สถานภาพสมรส
   1. โสด 2. คู่ 3. หม้ายหย่า แยก
5. ระดับการศึกษา
   1. ไม่ได้เรียนหนังสือ 2. ประถมศึกษา
   3. มัธยมศึกษา หรือ เทียบเท่า 4. อนุปริญญา หรือ ประกาศนียบัตร
   5. ปริญญาตรี หรือ เทียบเท่า 6. อื่น ๆ โปรดระบุ…….
6. อาชีพ
   1. รับราชการ/รัฐวิสาหกิจ 2. ค้าขาย/ธุรกิจส่วนตัว
   3. เกษตรกรรม 4. รับจ้าง
   5. นักเรียน/นักศึกษา 6. อื่น ๆ โปรดระบุ…….
7. ที่อยู่อาศัยในปัจจุบัน
   1. อยู่กับครอบครัว 2. อยู่กับญาติ
   3. อยู่คนเดียว/เพื่อน
8. สาเหตุของการบาดเจ็บ
   1. รถจักรยานยนต์ 2. รถยนต์
   3. จักรยาน/เดินถนน 4. ตกจากที่สูง
   5. ถูกทำร้ายร่างกาย 6. กีฬา
9. วิธีเสียค่ารักษาพยาบาล
   1. เบิกค่ารักษาพยาบาลได้ 2. เสียค่ารักษาเอง
   3. ประกันสังคม 4. สังคมสงเคราะห์
   5. อื่น ๆ โปรดระบุ…….

แบบสอบถามอาการหลังการบาดเจ็บศีรษะ (อาร์ พี คิว)

หลังการได้รับอุบัติเหตุบาดเจ็บที่ศีรษะ ท่านมีอาการต่างๆ ที่ก่อให้เกิดความรำคาญ หรือความกังวล ดังนำเสนอไว้ในหน้าต่อไปข้อใดบ้าง และท่านรู้สึกว่าเป็นปัญหาในระดับใด มีหลายอาการที่อาจเกิดกับท่านตั้งแต่ก่อนเกิดอุบัติเหตุ ขอให้ท่านเปรียบเทียบในปัจจุบันกับก่อนเกิดอุบัติว่าอาการดังกล่าวเป็นปัญหาระดับใด โดยในแต่ละอาการให้**วงกลมล้อมรอบตัวเลข** 0, 1, 2, 3 หรือ 4 ตอบให้ตรงความรู้สึกของท่านมากที่สุด โดยตัวเลขแต่ละตัวมีความหมายดังนี้

0	หมายถึง	ไม่เคยมีอาการทั้งก่อนและหลังการบาดเจ็บ
1	หมายถึง	มีอาการ แต่รู้สึกว่าไม่เป็นปัญหา
2	หมายถึง	มีอาการ และ รู้สึกว่าเป็นปัญหาเล็กน้อย
3	หมายถึง	มีอาการ และ รู้สึกว่าเป็นปัญหาปานกลาง
4	หมายถึง	มีอาการ และ รู้สึกว่าเป็นปัญหามาก

ตัวอย่าง

1. ปวดท้อง 0 ① 2 3 4

หมายความว่า ท่านมีอาการปวดท้องแต่รู้สึกว่าไม่เป็นปัญหา

หรือ หลังการบาดเจ็บท่านมีอาการปวดท้องเหมือนกับก่อนได้รับบาดเจ็บ แต่รู้สึกว่าไม่เป็นปัญหา

2. ปวดหลัง 0 1 2 3 ④

หมายความว่า ท่านมีอาการปวดหลัง และรู้สึกว่าเป็นปัญหามาก

หรือ ก่อนได้รับบาดเจ็บท่านเคยมีอาการปวดหลัง และหลังการบาดเจ็บปัจจุบันท่านยังคงมีอาการปวดหลัง แต่รู้สึกว่าอาการปวดหลังนี้เป็นปัญหามากกว่าก่อนการได้รับบาดเจ็บมาก

เปรียบเทียบกับก่อนเกิดอุบัติเหตุ ปัจจุบันคุณมีอาการ

1. ปวดศีรษะ	0	1	2	3	4
2. เวียนศีรษะ / มึนงง	0	1	2	3	4
3. คลื่นไส้ และ/หรือ อาเจียน	0	1	2	3	4
⋮					
16. มีความกระวนกระวายหงุดหงิด	0	1	2	3	4

นอกจากปัญหาดังกล่าวข้างต้น คุณยังมีอาการอื่นๆ อีกหรือไม่ หากมีกรุณาเขียนอาการ และให้คะแนนระดับของความรุนแรงของอาการดังเช่นปัญหาดังกล่าวข้างต้น

17……..	0	1	2	3	4
18……..	0	1	2	3	4

แบบสอบถามผลกระทบความเจ็บป่วย

(Sickness Impact Profile)

คำแนะนำสำหรับผู้ตอบแบบสอบถาม

ในชีวิตประจำวันของคุณ คุณจะต้องมีกิจกรรมต่างๆ ที่จะทำบางเวลาคุณสามารถทำกิจกรรมต่าง ๆ เหล่านี้ได้หมด แต่ในบางเวลาอาจเป็นเพราะภาวะสุขภาพของคุณทำให้คุณไม่สามารถทำกิจกรรมเหล่านี้ได้ตามปรกติคุณอาจ

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แบบสอบถามมีจำนวน 136 ข้อ

แบ่งออกเป็นหมวดต่างๆ 12 หมวด ดังนี้

หมวดการนอนหลับพักผ่อน	7 ข้อ
หมวดพฤติกรรมทางอารมณ์	9 ข้อ
หมวดการดูแลร่างกายและการเคลื่อนไหว	23ข้อ
หมวดการจัดงานบ้าน	10ข้อ
หมวดการเคลื่อนย้าย	10ข้อ
หมวดปฏิกิริยาทางสังคม	20ข้อ
หมวดการเคลื่อนไหวร่างกาย	12ข้อ
หมวดพฤติกรรมแสดงถึงการตื่นตัว	10ข้อ
หมวดการสื่อสาร	9ข้อ
หมวดการทำงาน	9ข้อ
หมวดนันทนาการและการใช้เวลาว่าง	8ข้อ
หมวดการรับประทานอาหาร	9 ข้อ

<u>หมวดการนอนหลับพักผ่อน</u> (SR-0499)

กรุณากาเครื่องหมายถูก (/) เฉพาะคำถามที่คุณแน่ใจว่าบรรยายถึงตัวคุณในปัจจุบันและมีความสัมพันธ์กับภาวะสุขภาพของคุณ

1. ในวันหนึ่งๆ ฉันใช้เวลาส่วนใหญ่เพื่อนอนพักผ่อน _____(070-083)
2. ฉันนั่งเกือบตลอดทั้งวัน ไม่ค่อยลุกไปไหน _____(062-049)

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7. ฉันมักจะนอนหลับหรืองีบหลับในช่วงเวลากลางวัน _____(062-049)

กาเครื่องหมายถูก (/) เมื่อคุณได้อ่านคำถามหมดทุกข้อในหน้านี้แล้ว ☐

หมวดการรับประทานอาหาร (E-0705)

กรุณากาเครื่องหมายถูก (/) เฉพาะคำถามที่คุณแน่ใจว่าบรรยายถึงตัวคุณในปัจจุบันและมีความสัมพันธ์กับภาวะสุขภาพของคุณ

1. ฉันรับประทานอาหารได้น้อยลงกว่าปรกติ _____(085-037)

2. ฉันรับประทานอาหารได้แต่ต้องมีคนอื่นเตรียมอาหารให้พร้อมที่จะรับประทานให้ง่าย หรือต้องใช้อุปกรณ์พิเศษในการรับประทาน _____(073-077)

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9. ฉันไม่ได้กินอาหารทางปากเลย ต้องให้อาหารทางสายยางให้อาหารหรือให้น้ำเกลือ _____(076-133)

กาเครื่องหมายถูก (/) เมื่อคุณได้อ่านคำถามหมดทุกข้อในหน้านี้แล้ว ☐

APPENDIX B

APPENDIX B

Consent to participate in Research Study

คำชี้แจงสำหรับผู้ป่วยและการพิทักษ์สิทธิของผู้ป่วยในการวิจัย

เรียน ผู้เข้าร่วมวิจัยทุกท่าน

ดิฉันนางสาว ธนาภรณ์ เปรมสัย นักศึกษาพยาบาลปริญญาโทหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาการพยาบาลผู้ใหญ่ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล ขณะนี้กำลังทำวิจัยเรื่อง **การศึกษาติดตามการปรับตัวของผู้ป่วยบาดเจ็บศรีษะระดับเล็กน้อย** เพื่อนำผลการวิจัยที่ได้ไปเป็นแนวทางในการวางแผนการพยาบาลของผู้ป่วยกลุ่มนี้เพื่อส่งเสริมการฟื้นหายที่ดียิ่งขึ้น จึงใคร่ขอความร่วมมือในการตอบแบบสอบถามตามความเป็นจริงเกี่ยวกับตัวท่านโดยใช้เวลาประมาณ 30 - 50 นาที ซึ่งข้อมูลทั้งหมดจะถูกเก็บเป็นความลับและนำมาใช้ตามวัตถุประสงค์เท่านั้น

ท่านมีสิทธิจะตอบรับหรือปฏิเสธการเข้าร่วมวิจัยครั้งนี้ เมื่อเข้าร่วมการวิจัยแล้ว ระหว่างตอบแบบสอบถามท่านสามารถยกเลิกการตอบแบบสอบถามได้ตลอดเวลาตามที่ท่านต้องการ โดยไม่มีผลใด ๆ ต่อการรักษา หากท่านมีข้อสงสัยประการใดเกี่ยวกับการวิจัยครั้งนี้ ผู้วิจัยยินดีตอบคำถามให้ท่านได้ตลอดเวลา

ขอบคุณในความร่วมมือของท่าน

ภาควิชาพยาบาลศาสตร์ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี

วันที่ เดือน พ.ศ

เรื่อง ขอความร่วมมือในการตอบแบบสอบถาม

เรียน

เนื่องด้วยดิฉัน นางสาว ธนาภรณ์ เปรมสัย นักศึกษาปริญญาโท หลักสูตรพยาบาลศาสตร์มหาบัณฑิต สาขา การพยาบาลผู้ใหญ่ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัย มหิดล ขณะนี้กำลังทำวิจัย เรื่อง การศึกษาติดตามการปรับตัวของผู้ป่วยที่ได้รับบาดเจ็บที่ศีรษะระดับเล็กน้อย เพื่อนำผลการวิจัยที่ได้ไปเป็นแนวทางในการวางแผนให้การพยาบาลกับผู้ป่วยกลุ่มนี้ เพื่อส่งเสริมการฟื้นหายที่ดียิ่งขึ้น จึงใคร่ขอความร่วมมือในการตอบคำถามตามความเป็นจริงเกี่ยวกับตัวท่าน ซึ่งคำตอบของท่านจะได้รับการพิทักษ์สิทธิ์ โดยเก็บเป็นความลับและนำมาใช้ตามวัตถุประสงค์ของการวิจัยเท่านั้น แบบสอบถามประกอบไปด้วย 2 ส่วน คือ

ส่วนที่ 1 แบบสอบถามเกี่ยวกับอาการแสดงหลังการบาดเจ็บที่ศีรษะ

ส่วนที่ 2 แบบสอบถามผลกระทบจากความเจ็บป่วย

ท่านมีสิทธิ์จะตอบรับหรือปฏิเสธการเข้าร่วมการวิจัยครั้งนี้โดยไม่มีผลเสียใด ๆ ต่อการเข้าใช้บริการด้านสุขภาพในทุก ๆ โรงพยาบาลและสถานบริการสุขภาพทุกแห่ง และขอขอบคุณมา ณ ที่นี้

(น.ส. ธนาภรณ์ เปรมสัย)

หมายเหตุ

1. เมื่อตอบแบบสอบถามเสร็จแล้วโปรดดึงแผ่นกระดาษแผ่นนี้ออก
2. โปรดส่งแบบสอบถามนี้กลับคืนภายในวันที่ เดือน พ.ศ. 2543 โดยได้จ่าหน้าซองและติดดวงตราไปรษณีย์ไว้เรียบร้อยแล้ว

APPENDIX C

APPENDIX C

List of experts consulted on validation of the instrument

Four consulting experts included determined the content validity of the Rivermead Post Concussion Symptoms Questionnaires (RPQ)

1. Assistant Professor Manot Loawong
   Department of surgery, McCormick Hospital.
2. Associate Professor Siraya Summawart
   Department of Nursing, Faculty of Medicine, Ramathibodi Hospital, Mahidol University.
3. Dr. Borrirak Chareonsil
   Department of surgery, Sawanpracharak Hospital.
4. Miss Gedsana Saloa
   Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University.

BIOGRAPHY

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