The Post Concussion Symptom Experience, Post Concussion Symptom Management, and Quality of Life in Persons With Mild Traumatic Brain Injury in Indonesia

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ABSTRACT

This study aims to identify the Post Concussion Symptoms (PCS) experience and PCS management and to determine the level of quality of life (QoL) in persons with mild traumatic brain injury (mTBI) in Indonesia. One hundred thirty six persons were purposive selected from two government hospitals in Aceh Province. The data were obtained using questionnaires composed of four parts: (1) The Demographic and Health-Related Data Form, (2) the Rivermead Post Concussion Symptoms Questionnaire (RPQ), (3) the Symptom Self Management Scale adapted for TBI (SSMS-TBI) and (4) the Quality of Life after Brain Injury Overall Scale (QOLIBRI-OS). The questionnaires were content validated by three experts, thereafter it were completed for translation process. The intraclass correlation coefficients for the Indonesian version of the RPQ yielded a value of .92, and the SSMS-TBI (six parts) yielded values between .77 and .90, and the internal consistency reliability coefficient of the Indonesian version of the QOLIBRI-OS was .91. Descriptive statistics were used to analyze data. The results were as follows:

The majority of the subjects were young adult age (*Mdn* = 27 years, *IQR* = 18, *range* = 18-65). Most of subjects remained either working or studying post mTBI. The causes of mTBI were mainly from motorcycle accident (88.3%).

Overall, the subjects experienced on average seven symptoms (*range* = 1 - 14) within 2 - 60 weeks. The symptoms occurrence were occasional frequency (*M* = 2.32, *SD* = 0.55) and at a slightly level of the severity (*M* = 1.03, *SD* = 0.51). The most common PCS occurrences were dizziness, headache, fatigue, forgetfulness, and taking longer to think, respectively. Blurred vision, hearing disturbance, and dizziness were reported as the most severe symptoms.

PCS management strategies which commonly performed by the subjects were: activities/thought (e.g., don't dwell on it, talk with family, and lay down), complementary therapies (e.g., "*dzikir*" [remembering and drawing oneself close to Allah], praying, and using massage), and promoting nutrition (e.g., eating well). These strategies were used because they were routine activities, easy to perform, cheap and fast. Overall, the subjects evaluated their management strategies at moderate to high level of the effectiveness. The total QoL score was reported at a moderate level (*M* = 3.73, *SD* = 0.76). The physical dimension of QoL score was the lowest (*M* = 3.47, *SD* = 0.94), while the personal/social dimension of QoL score was the highest (*M* = 4.01, *SD* = 0.87).

The study results provide clinical evidence for nurses and health care professionals in Indonesia. To reduce PCS severity and improve QoL, healthcare professionals should be aware of the common PCS and increase proactive strategies in providing PCS management interventions to the persons with mTBI.

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CHAPTER 1

INTRODUCTION

Background and Significance of the Problem

Traumatic brain injury (TBI) is one of the most common causes of disability and death worldwide. Each year, at least 200 people in 100,000 suffer from TBI (Parrillo & Dellinger, 2008). In the US, TBI made up one- third of all the causes of death related to injury, an estimated 1.7 million suffering with TBI annually (Faul, Wald, & Coronado, 2010). In Asia, the estimated numbers of TBI is shown as 55.4 per 100,000 people in China, 85 per 100,000 people in Japan, and 160 per 100,000 people in India (von Holst, 2007). In Indonesia, the number of TBI was ranked as the third most common cause of in-hospital death, with a total number of 1,025 deaths in the year 2010 (Ministry of Health Indonesia, 2011).

The number of mild traumatic brain injury (mTBI) was ranked the highest in overall TBI cases, at approximately 80% of the TBI cases (Faul et al., 2010). The actual numbers of mTBI was difficult to determine and probably higher than the data reported as some victims were not treated at hospital, and did not receive or seek medical care (Faul et al., 2010). Of the persons with mTBI who seek treatment at the emergency department (ED), approximately 38% were discharged without further follow up (Bazarian, McClung, Chenh, Flesher, & Schneider, 2005). Due to no medical care being sought and lack of follow up after discharge, the patients with mTBI developed adverse symptoms, namely post concussion symptoms [PCS] (Department of Veterans Affairs, Department of Defense [VA/DoD], 2009).

The Symptom Management Model (SMM) provided direction for informing an array of symptoms related to a variety of disease and conditions (Dodd et al., 2001). This model has three main dimensions including (1) symptom experience, (2) symptom management strategies and (3) outcomes (i.e., functional status, emotional status, self care, costs, mortality, morbidity and co-morbidity, and quality of life [QoL]). In addition, these three main dimensions were influenced by three factors including (1) person, (2) health and illness, and (3) environment domain. This model can be used to explain the symptom-related, including the PCS of patients with mTBI.

The PCS most likely being reported post mTBI. Around 86% of patients with mTBI developed PCS immediately after injury (Lundin, de Boussard, Edman, & Borg, 2006) and up to 50% still reported PCS even one year post injury (Fourtassi et al., 2011). The PCS composed of the physical, cognitive and affective symptoms. The physical symptoms (e.g., headache, dizziness, fatigue, and sleep disturbance) were commonly reported at acute phase or less than three months (Bergman, 2011; Lannsjo, AfGeijerstam, Johansson, Bring, & Borg, 2009). Moreover, the cognitive symptoms (e.g., forgetfulness and poor concentration) and affective symptoms (e.g., irritability and anxiety) were more prominent at one year post injury (Fourtassi et al., 2011; Roe, Sveen, Alvsaker, & Bautz-Holter, 2009). The PCS could continue to be long term sequel up to six years post injury (Konrad et al., 2011; King & Kirwilliam, 2011).

The previous studies reported that the level of severity of PCS variously. The PCS was more severe at initial post injury (Paniak et al., 2002, Ponsford et al., 2011), mild to moderate level at three months (Kashluba et al., 2004) and up to one year (Fourtassi et al., 2011). Predominantly, headache, fatigue, and poor concentration were commonly rated at high level than other symptoms (Fourtassi et al., 2011; Kashluba et al., 2004; Lannsjo et al., 2009; Paniak et al., 2002). Anxiety, noise sensitivity and trouble thinking were rated at low level, but they were the strongest predictor of long term or persistence PCS (Dischinger et al., 2009). The PCS experience could lead the patients with mTBI faced with problems, such as difficulty return to pre-injury activities (Yang, Tu, Hua, & Huang, 2007), functional status disturbance (Nolin & Heroux, 2006), and alteration of their family relationship (Fourtassi et al., 2011). Due to the effects of the PCS, the persons with mTBI should perform several strategies to manage their PCS.

The previous studies reported that persons with mTBI managed their PCS by themselves and/or seeking helps. For example, Baggerly (2004) found that persons with mTBI performed exercise, coping management, getting support from friends and family, and using antidepressant drugs. Similarly, Bergman (2011) found that the persons with mTBI performed exercise, several activities/thoughts and complementary therapies, consumed enough nutrition and medication. The frequency of performing the strategies has been associated with the effectiveness of the strategies to relieve the PCS (Bergman, 2011). However, when the persons with mTBI did not practice or receive suitable PCS management strategies, their PCS become persist (Marshall, Bayley, McCullagh, Velikonja, & Berrigan, 2012). Consequently, outcomes may be altered; in particular, the QoL.

QoL is the crucial indicator that can indicate health outcomes (Truelle et al., 2010). QoL was described as a person’s perspective on his or her subjective health condition, functioning, and well-being (von Steinbuchel, Richter, Morawetz, &

Riemsma, 2005). In general, QoL composed of four major domains including physical, psychological, social, and environment (Skevington, Lotfy, & O'Connell, 2004; WHO, 1997). In TBI population, the domain of QoL was more specific in term of cognitive impairment due to neurological injury. Cognitive impairment could be affecting the patients with mTBI in cope with their conditions post injury and their satisfaction of future prospect (von Steinbuchel et al., 2010). Recently, the QoL in TBI population typically assess the satisfaction of (1) physical condition, (2) cognition, (3) emotions, (4) function in daily life, (5) personal and social life, and (6) current situation and future prospect (von Steinbuechel et al., 2012).

Previous researchers who examined the QoL in patients with mTBI, found various levels of QoL within one month to ten years (Beseoglu, Roussaint, Steiger, & Hanggi, 2012; Fourtassi et al. 2011; Zhang, Carroll, Cassidy, & Paniak, 2009; Zumstein et al., 2011). Zhang et al. (2009) found that most their subjects (70.8%) reported their QoL at poor to fair level, within three months post mTBI. At one to 10 years post injury, three studies showed that patients with mTBI had the moderate to high QoL level (Beseoglu et al., 2012; Fourtassi et al., 2011; Zumstein et al., 2011). For each domain of the QoL, the physical domain was mostly found in the lower than the emotions, cognition, social and function domains (Beseoglu et al., 2012). The various QoL findings from the previous studies may be influenced by several factors as mentioned in the SMM.

Based on the SMM by Dodd et al. (2001), person, health and illness, and environmental factors were greatly effect to the PCS phenomenon. Therefore, although the existing knowledge was established, they had two gaps of knowledge. Firstly, the findings of the previous studies were conducted in western countries that may not be applicable to the eastern countries, such as Indonesia. Environmental contexts in western and Indonesian societies have been constructed differently with regard to family structure, health care system, belief and religion, and socio-cultural aspects. These factors could possibly make the patients with mTBI perceive PCS and manage the PCS differently affecting to QoL. Secondly, the existing knowledge about PCS experience, PCS management and QoL of Indonesian persons with mTBI is limited. Therefore, it is important to investigate PCS experience, PCS management, and QoL of Indonesian persons with mTBI. Such important knowledge will be helpful for health professionals in providing significant care, improve the capability to perform the PCS management and promote good level of the QoL in Indonesian persons with mTBI.

Objectives of the Study

The objectives of the study were to:

1. Identify the occurrence, frequency, and severity of PCS in persons with mTBI
2. Explore the PCS management strategies of persons with mTBI
3. Determine the level of QoL in the persons with mTBI

Research Questions

The research questions of the study were:

1. What is the occurrence, frequency and severity level of PCS in persons with mTBI ?
2. What are the PCS management strategies of persons with mTBI ?
3. What is the level of QoL in the persons with mTBI ?

Conceptual Framework

The conceptual framework of this study was constructed based on the Symptom Management Model (SMM) (Dodd et al., 2001) and literature review concerning the concept of QoL (von Steinbuechel et al., 2005, 2010, 2012).

The SMM is comprised of three dimensions, including (1) symptom experience, (2) symptom management strategies and (3) outcomes. Symptom experience is a dynamic process consisting of the individual's perception of a symptom, evaluation of the meaning of symptom and response to the symptom. Perception of symptom is the individual feeling about the symptom that he/she experiences. Evaluation of symptom is the individual judgments about the characteristics of a symptom, including frequency, severity, causes, and the impact of the symptom on the individual's lives. Response to the symptom is individual reflection of the symptom that can be seen in the changes to their physical, mental and behavioral aspects (Dodd et al., 2001). The dimensions of symptom experience were used to understand the phenomenon of PCS in persons with mTBI. For example, after experiencing the mTBI, the persons felt headache. Then, they evaluated the frequency of headache occurrence, the level of severity as mild, moderate or severe. The response is displayed in mental and behavioral changes, such as mood alteration and/or sleep disturbance.

Symptom management strategies are the methods used by individuals to relieve or alleviate their PCS. Symptom management strategy refers to the identification of the strategy ("what", and "why"), development and establishment of a symptom management strategy ("how", "when", "where", "how much" and "to whom") and its effectiveness. As Dodd et al. (2001) mentioned in the SMM, the strategies of symptom management were needed to be explored because it was closely correlated with the other dimensions (symptom experience and outcomes), such as the management strategies are effective or ineffective to reduce/avoid negative outcomes.

Finally, outcomes consist of symptom status, functional status, emotional status, self-care, mortality, morbidity, cost, and QoL. Outcome is influenced by symptom experience and symptom management (Dodd et al., 2001). Most frequent and severe symptoms would affect poor outcomes, and require effective management strategies.

According to the SMM of Dodd et al. (2001) the QoL, is one of the outcomes that has not been explained further. In the area of health care and rehabilitation following TBI, the ultimate goal is to return a person to full health, or to maintain a good level of QoL (Berger et al. as cited in von Steinbuechel et al., 2010). The concept of QoL specific to neurological disease was reviewed by von Steinbuechel et al. (2005). The QoL refers to a person's view on their subjective health condition, functioning, and well-being in the domains of physical, psychological (emotional and cognitive), social, and daily life (von Steinbuechel et al., 2005). The cognitive domain was an important aspect of neurological impairment, including mTBI cases (von Steinbuechel et al., 2005). Recently, von Steinbuechel et al. (2012) provided a profile of QoL in domains typically affected by persons with mTBI that refers to satisfaction of physical condition, cognition, emotions, function in daily life, personal and social life, current situation and future prospects.

In this study, the symptom experience is used to guide understanding about perception and evaluation of PCS occurrence, frequency and severity. The symptom management strategies are used to guide understanding about PCS management including “what”, “why, “how”, “when”, “where”, “how much” “to whom” and “how well it work” to relieve the PCS. Finally, the outcome is represented by studying QoL to determine the satisfaction level of life in persons post mTBI.

Definition of Terms

The PCS experience refers to perception and evaluation of persons with mTBI regarding their symptoms' occurrence, frequency and severity. Persons perceived and evaluated their symptoms over the previous week. PCS experience is measured by using the Rivermead Post Concussion Symptom Questionnaire (RPQ) (King, Crawford, Wenden, Moss, & Wade, 1995). The high score means the high PCS experience.

PCS management refers to any strategies or activities that persons with mTBI used to manage and alleviate their PCS over the previous week. Those strategies included what and how the strategy was conducted, the reason of conducting the strategy, when and where it was conducted, who helped while they conducted and how much and how the effectiveness of the strategy was. The PCS management was assessed by using the Symptom Self-management Scale adapted for TBI (SSMS-TBI) (Bergman, Fabiano, & Blostein, 2011). The high score means the strategies were often used by the subjects.

The QoL refers to the perception of persons with mTBI about overall satisfaction with their physical conditions, cognition, emotions, function in daily life, personal and social life, and current situation and future prospect over the past one week and present. The QoL was measured by using the Quality of Life After Brain Injury Overall Scale (QOLIBRI-OS) (von Steinbuchel et al., 2012). The high score means the high level of QoL.

Scope of the Study

This study was a descriptive study to investigate PCS experience, PCS management, and QoL in persons with mTBI. This study recruited the persons with mTBI in Banda Aceh city, Aceh, Indonesia. The data collection process was performed from December 2012 to March 2013.

Significance of the Study

The findings of this study were contributed to:

1. Provide the baseline data for future research relating to the PCS experience, PCS management and QoL in persons with mTBI in Indonesia.

2. Provide knowledge of PCS management which had been done by subjects. Therefore, the nurses are able to correct and conduct the proper PCS management strategies to the persons with mTBI related to the health care setting in Indonesia.

CHAPTER 2

LITERATURE REVIEW

This chapter presented the literature review related to the post concussion symptom (PCS) experience, post concussion symptom management, and quality of life (QoL) in persons with mild traumatic brain injury (mTBI). The topics were as follow:

1. Overview of mTBI
2. Symptom management model
3. PCS experience in persons with mTBI
    3.1 Literature review related to PCS experience in persons with mTBI
    3.2 Factors related to PCS experience in persons with mTBI
    3.3 PCS assessment in persons with mTBI
4. PCS management in persons with mTBI
    4.1 Literature review related to PCS management in persons with mTBI
    4.2 Factors related to PCS management in persons with mTBI
    4.3 Assessment of PCS management in persons with mTBI
5. QoL in persons with mTBI
    5.1. Literature review related to QoL in persons with mTBI
    5.2. Factors related to QoL in persons with mTBI
    5.3. QoL assessment in persons with mTBI
6. Conclusion

Overview of Mild Traumatic Brain Injury

The brain is the center of the body, has the function of communication and controls the body. Overall, the brain includes three components that consist of 80 % of brain tissue, 10 % of cerebrospinal fluid (CSF) and 10 % of blood (Schinner et al. as cited in Price, Collin, & Gallagher, 2003). The brain is divided into four major areas including frontal, temporal, occipital and parietal. The frontal area controls emotional responses, ethical behavior and morality, and speech. In addition, auditory, memory, and speech in terms of expressing and interpreting are the function of temporal area. Visual perception is a function of the occipital area, and visual interpretation is the function of temporal and parietal area. Moreover, the parietal area has other functions such as other sensations including touch and pain. Due to the crucial functions of brain and the structure of the tissue of brain being tender and fragile, it is protected by CSF and three meningeal layers (duramater, arachnoid, and piamater) that provide a flotation and shock-absorbing facility; and the rigid bone of the skull for protection from external trauma (Copstead & Banasik, 2005; Gould & Dyer, 2011).

Traumatic brain injury (TBI) is defined as the physical injuries that occur because external forces are likely to blunt, penetrating or cause trauma to the skull, brain tissue and/or cerebral blood flow which cause structural and physiological destruction of brain function. The effects will be mild when it just bruising in brain tissue, but severe and life-threatening when there is brain tissue destruction and massive swelling of the brain (Gould & Dyer, 2011).

Incidence of TBI is high when caused by several leading sources. The leading causes of TBI are traffic or motor vehicle accidents, falls, sport-related, beatings, blunt and missile injury (Hargrove-Huttel, 2005). More than 50 percent of TBI are due to traffic accidents (Parrillo & Dellinger, 2008). In developing countries, road traffic injury is prominent (WHO, 2012a). In South-East Asia, road traffic injury is the leading cause of mortalities related to injury with a rate of 16.6 per 100,000 populations. Indonesia is one of the countries in the South-East Asian region with an estimated of road traffic injury death accounting for 16.2 per 100,000 populations (WHO, 2011). The incidence of TBI in males is more often than in females and most common in young adults under the age of 45 years (Faul et al., 2010).

The mechanisms of brain injury are classified as focal brain damage and diffuse brain damage. Focal brain damage results from concussion, contusion, laceration and intracranial hemorrhage. Diffuse brain damage is caused by acceleration/ deceleration injury resulting in brain swelling. The outcomes of brain injury are primary damage happening at the present of impact, such as laceration or crushing of the neuron, glial cell and blood vessel of the brain; and secondary damage from the additional effects of cerebral edema, hemorrhage, hematoma, cerebral vasospasm, and ischemia related to systemic factors (Gould & Dyer, 2011; Werner & Engelhard, 2007).

Clinical signs and symptoms will immediately occur following TBI as the result of disruption of brain function. These are loss of consciousness, loss of memory or post traumatic amnesia, alteration in mental state at the time of the injury or alteration of consciousness, neurological deficit (e.g., weakness, loss of balance, change in vision, paresis, sensory loss, and aphasia) and intracranial lesion. Other clinical signs are assessed by using the Glasgow Coma Scale (GCS). The GCS is used to classify the severity level of TBI and also useful to assess the level of consciousness. The components of GCS are eye response (range of score 1-4), verbal response (range of score 1-5), and motor response (range of score 1-6). The data is interpreted by calculation, the highest score is 15.The GCS score classifies the TBI in three groups, mild (GCS score 13-15), moderate (GCS score 9-12) and severe levels (GCS score $\leq$ 8) (Copstead & Banasik, 2005; Peniket & Grove, 2007; VA/DoD, 2009). Mild traumatic brain injury (mTBI) has the highest incidence, accounting for at least 80% of TBI cases (Fault et al., 2010). Although it is not a life threatening condition or as moderate or severe as TBI, mTBI impacts suddenly and the consequences could be persistent (Alexander, 1995). Thus, mTBI is the focus of this study.

Mild traumatic brain injury was first defined in 1966 by the Congress of Neurological Surgeon. At that time, mTBI was only focused on in terms of general symptoms including altered mental state, vision problem and balance disturbance. Then, in 1993, the American College of Rehabilitative Medicine added four specific criteria for mTBI. Those criteria are (1) loss of consciousness, (2) loss of memory of the initial event, (3) alteration in mental state like feeling dizziness, disorientation and confusion, and (4) focal neurological deficit (Len & Neary, 2011). Moreover, WHO described mTBI as an acute brain injury resulting from an external mechanical force to the head, with the criteria of mTBI including (1) confusion or disorientation, (2) loss of consciousness (LOC) for 30 minutes or less, (3) post-traumatic amnesia for less than 24 hours,(4) neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery, and (5) GCS score of 13–15 after 30 minutes post-injury (Ruff et al., 2009).

The primary neuropathology in mTBI concerns the swollen axon as a characteristic of diffuse axonal injury. The trauma impairs the axonal transport, so the intra-axonal fluid collects at the point of injury. The axon could swell or rupture. When the multiple axonal injuries happen, the condition damages the fragile structures running along the long axis of the brain (Alexander, 1995; Taber & Hurley, 2013). Secondary neuropathology is a metabolic brain injury. The injury leads to vascular injury that could disrupt small veins, producing hemorrhages and lead to local or focal edema (Busch & Alpern, 1998; Len & Neary, 2011; Werner & Engelhard, 2007). In addition, mTBI damages the microstructural white matter integrity as a result of force to the head. Microstructural white matter damage is a result of straining, stretching, deforming or even shearing forces. The reduction in white matter integrity can be assessed by using Magnetic Resonance Imaging (MRI) measures of microstructural brain injury and is correlated with severity of PCS after injury (Smits et al., 2011).

In mTBI cases, metabolic injury more commonly occurs rather than structural injury (Barkhoudarian, Hovda, & Giza, 2011). Prigatano and Gale (2011) mentioned that although mTBI may produce metabolic and neuropathologic change, structure neuro-imaging studies may be normal. The cause of metabolic brain injury is interruption of cerebral autoregulation. Metabolic injury is responsible for some of the early signs and symptoms. The persons with mTBI may have quick onset of short-lived impairment of neurologic function (Prigatano & Gale, 2011). Detailed information about symptoms in persons with mTBI will be discussed in the PCS experience section.

Symptom Management Model

The Symptom Management Model (SMM) was developed at the Research Center for Symptom Management at the University of California, San Francisco and first published in 1994. Later, this model was modified to clearly explain the relationships in each dimension, and the link with the nursing domains (Dodd et al., 2001).

Dodd et al. (2001) defined symptom as a subjective experience that reflects a persons' changes in biopsychosocial functioning, sensations and cognition. Symptom management is a strategy that persons use in biomedical, professional and self-care methods for managing symptom occurrence with the goal of avoiding negative outcomes. The SMM consists of three dimensions including symptom experience, symptom management strategies, and outcomes. These dimensions are influenced by three domains, including person, health and illness and environment (Dodd et al., 2001).

The dimensions of symptom management model. There were three dimensions in the SMM including symptom experience, symptom management and outcomes. These dimensions were used to describe the dynamic process of PCS in persons with mTBI in this study.

Symptom experience. Symptom experience refers to an individual's perception of a symptom, evaluation of the meaning of a symptom and response to a symptom. The subjective information can be obtained from subject's self report. Perception of symptoms means that the subject observes a change that he or she feels or displays. Evaluation of symptoms means making a judgment about symptom frequency and the severity of the symptom. Response to symptom refers to the physiological, psychological, socio-cultural and behavioral change as an effect of symptoms. An example of subject's perception, evaluation and response to the symptom is the persons perceive that they feel discomfort and have a headache. Then, the person evaluates the frequency of headache occurrence as occasionally, with severity at a moderate level. The persons' response might stress (psychological component), that may possibly threaten the hemodynamic system (physiologic component), which disturbs their daily activities or social functioning (socio-behavioral component). However, this study investigates the occurrence, frequency and severity of PCS.

Symptom management strategies. Symptom management is the way to relieve or alleviate the symptom. Symptom management strategy refers to how to identify the strategy ("what", and "why"), develop and establish a symptom management strategy ("how", "when", "where", "how much" and "to whom"), and finally assess how well it works. The goal of symptom management is to "avert or delay a negative outcome through biomedical, professional and self-care strategies" (Dodd et al., 2001, *p*. 673).

Importantly, Dodd et al. (2001) stated that symptom management strategies were a dynamic process and often demand change over time. One strategy may also reduce more than one symptom. The strategies implemented by the persons themselves and/or through assistance from their family or health professionals. For example, relaxation techniques are used to treat headache, and could treat dizziness and anxiety simultaneously. However, when the relaxation techniques are not effective, the persons with mTBI need to perform other strategies such as seeking help from health care providers.

Outcomes. Outcomes are the third dimension construct within the SMM, consisting of eight factors: (1) symptom status, (2), functional status, (3) emotional status, (4) mortality, (5) morbidity and co-morbidity, (6) costs, (7) self-care, and (8) QoL (Dodd et al., 2001). Outcomes are the consequence of the symptom experience and the symptom management strategies. For instance, when the severity of PCS in persons with mTBI is high, it could greatly impact on all factors in outcomes, especially QoL. However, if the persons managed their PCS appropriately, the symptoms would be controlled or decreased. So, the persons might be satisfied with their lives post mTBI. Measuring the QoL as one of the outcomes, could provide subjective data about the subject's satisfaction with their life after mTBI, including their physical condition, cognition, emotions, functions in daily life, personal and social life, and the current situation and the future prospects (von Steinbuechel et al., 2012).

The domains of the symptom management model. Dodd et al. (2001) identified three domains related to the dimensions of the SMM, including person, health and illness, and environment.

Person domain. The person domain is comprised of internal factors which influence the way an individual responds to the symptom. Person domain consists of demographic, psychological, social, physiological, and developmental factors.

Health and illness domain. The health and illness domain concerns the subject's health condition before and/or after injury. This domain is composed of risk factors, injury factors, and disability and illness factors.

Environment domain. The environment domain is composed of physical, social and cultural aspects. The physical environment includes home, work and hospital environment. Social environment includes social support and interpersonal relationships. The cultural environment refers to individual beliefs, values and practices that are influenced by ethnicity, race, and religion. The environment contributes to the subject's perception to their symptoms. Moreover, the availability of the health care service and medical supplies influences the persons' access and management of the symptoms.

In this study, these three domains were used to collect data in order to help the explanation of the three variables; PCS experience, PCS management, and QoL in persons with mTBI in Indonesia.

Post Concussion Symptom Experience of Persons With Mild Traumatic Brain Injury

The review concerning PCS outlined common symptoms that occur following mTBI. PCS could be classified in three groups, including physical, cognitive and affective symptoms (Bergman, Bay, Kalamazoo, & Lansing, 2010; Chong, 2008; The Defense Centers of Excellence [DCoE], 2010; VA/DoD, 2009).

Physical symptoms. The physical symptoms consist of physical problems in general and sensation. Physical problems in general are described as dizziness, headache, fatigue, sleep disturbance, nausea, balance disorder, and neck pain. Moreover, the sensation problems consist of blurred vision, sensitivity to light, sensitivity to noise, hearing difficulties (e.g., tinnitus and reduced auditory acuity), loss or altered sense of smell and taste (Bergman et al., 2010; Chong, 2008; Greenberg, 2006; VA/DoD, 2009; Willer & Leddy, 2006). The common physical symptoms were headache, dizziness, fatigue and sleep disturbance (Bergman, 2011;Lannsjo et al., 2009). Their causes and manifestations are discussed as follows:

Headache. Headache may occur due to scalp injury, neck injury and/or injury of vascular system that disrupts oxygenation and metabolism of axon and ends with ischemia (Alexander, 1995). These conditions affect insufficiency of nutrients, muscle triggers and the hyperactive contractile region, and increase sensitivity to feelings of discomfort (Simons et al. as cited in Quinn, Chandler, & Moraska, 2002). Persons with mTBI describe a headache as pain, throbbing, aching, dullness, heaviness and tightness (DCoE, 2010; Kliangda, 2009).

Dizziness. Dizziness may happen due to peripheral vestibular injury caused by physical trauma on the temporal skull, labyrinthine concussion and dysfunction of superior semicircular. The manifestations of this condition are balance disorder and altered coordination (Alexander, 1995; DCoE, 2010). Dizziness is associated with hearing loss, tinnitus, headache, balance disorder, and diplopia (double vision) (DCoE, 2012).

Fatigue. Ponsford et al. (2012) reviewed the nature and the causes of fatigue. Fatigue occurs due to hypothalamic injury, and transmission deterioration between the central nervous system and peripheral nervous system. The injury affects depletion of essential substrates of functioning such as hormone or neurotransmitter and or dismisses ability to contract muscle. Persons with mTBI perceive lack of energy, impaired attention and informational processing speed, so they need to expend greater effort in performing activities (Ponsford et al., 2012). Fatigue occurs as a primary effect of central nervous injury and as secondary effect that causes other symptoms (DCoE, 2010). Fatigue is most commonly found in patients with mTBI who report most physical problems, such as chronic disease, chronic pain, cognitive problems, and for those who use some medications which also effect fatigue, including pain medication and sedation (Paniak et al., 2002). Furthermore, Stulemeijer et al. (2006) reported that severe fatigue was highly associated with the presence of other symptoms, especially nausea and headache at initial injury; and reduction of physical and social functioning.

Sleep disturbance. Sleep disturbance may due to injury in the ascending reticular activating system, limbic system and the basal ganglia (Chaudhuri & Behan as cited in Ponsford et al., 2012). Sleep disturbance also may contribute to other physical symptoms (i.e., headache, fatigue, and dizziness) and affective symptoms (i.e., anxiety and depression). Patients with mTBI reported the sleep disturbance such as interference of circadian rhythm sleep and delayed circadian timing (Ponsford et al., 2012).

Cognitive symptoms. Cognitive symptoms refer to forgetfulness or memory problems (verbal and visual memory), difficulty in learning, difficulty in reasoning, difficulty in processing information, alteration of attention and concentration, and executive dysfunction (Chong, 2008; Greenberg, 2006; Hall, Hall & Chapman, 2005; VA/DoD, 2009). Cognitive symptoms are the direct consequence of neurological injury and typically associated with injury in the temporal area (Gould

& Dyer, 2011). Left temporal area damage has been linked to impairment of verbal recognition memory. Right temporal area damage has been linked to visual recognition memory (Hunkin et al. as cited in Freece, 2011). The patients with mTBI who are shown to lesions on the temporal side by MRI test have increased tendency to be forgetful or have memory problems. These problems can be storage problems, decreasing in performance, reduction of information processing speed, and decreasing of attention (Kurca, Sivak, & Kucera, 2006).

Affective symptoms. Affective symptoms referred to a state of feeling, consisting of anxiety, depression, mood swing, irritability, aggression, impulsivity, agitation, lack of motivation, loss of libido and apathy (Chong, 2008; Greenberg, 2006; VA/DoD, 2009; Willer & Leddy, 2006). Affective symptoms are related to neurological injury, pain, physical and cognitive problems, and linked to each other (Alexander, 1995; Prigatano & Gale, 2011). For example, persons who have more severe headache might have more frequent depression, that in turn, interfere with cognitive functions, including concentration, memory and executive functions (Alexander, 1995). Additionally, for those present affective problems intensively are at high risk of developing persistent PCS (Prigatano & Gale, 2011).

Literature review related to post concussion symptoms experience of persons with mild traumatic brain injury

Post concussion symptoms commonly occur following mTBI. The PCS have been most commonly found during the first days and weeks (Paniak et al., 2002), and are usually resolved within three months (Kashluba et al., 2004; Lannsjo, Af Geijerstam, Johansson, Bring, & Borg, 2009; Lundin et al., 2006; Sigurdartotir et al.,2009; Yang, Hua, Tu, & Huang, 2009). However, the PCS still have been found even one year and over (Dean, O'Neil, & Sterr, 2012; King & Kirwilliam, 2011).

Previous researchers have studied the PCS experience of patients with mTBI including their occurrence and severity level. They used various tools (e.g., The Problem Check List from New York Head Injury Family Interview, The Rivermead Post concussion Symptom Questionnaire, and The Post concessional Screening Checklist) and collected data at different times post mTBI (e.g., one month, three months, and more than one year). The results showed that the physical symptoms were more commonly found than cognitive and affective symptoms (Lannsjo et al., 2009). The five common symptoms post mTBI were fatigue, headache, dizziness, forgetful and irritability (Bergman, 2011; Dean et al., 2012; Fourtassi et al., 2011; Ingebrigtsen, Waterloo, Marup-Jensen, Attner, & Romner, 1998; Kashluba et al., 2004; Mackenzie & McMillan, 2005; Paniak et al., 2002; Savola & Hillbom, 2003). Cognitive and affective symptoms were reported for long periods post injury, and/or are persistent (Fourtassi et al., 2011; Lannsjo, et al., 2009), whereas physical symptoms recover better than others (Ponsford, Cameron, Fitzgerald, Grant, & Mikocka-Walus, 2011). Similarly, Dean et al. (2012) and King and Kirwilliam (2011) found that cognitive problems occurred more significantly in patients with mTBI in the long term period post injury.

Regarding PCS severity, previous studies showed that patients with mTBI perceived their PCS at different levels. For example, Ponsford et al. (2011) found that the PCS severity was more severe at initial post injury or acute phase. Paniak et al. (2002) reported the mean scores of high PCS severity level at one month post injury were fatigue (M = 4.02), headache (M = 3.54), forgetfulness (M = 3.03), sleep disturbance (*M* = 2.86) and doing things slowly (*M* = 2.61) (the range from 1 = no severe to 7 = very severe). At three months post injury, the PCS severity was rated from mild to moderate level. The mean scores of PCS at three months post injury were headache (*M* = 2.41), sleep disturbance (*M* = 2.40), irritability (*M* = 2.17), anxiety (*M* = 2.11) and difficulty remembering (*M* = 2.06) with the mean in range 0 - 4 (Kashluba et al., 2004). Fourtassi et al. (2011) found that the PCS severity was rated from mild to moderate level. Forgetful was the more severe than other symptoms (*M* = 2.38) followed by irritability (*M* = 2.28), with the mean in range 0 - 4.

In conclusion, the persons with mTBI experienced the PCS including physical, cognitive and affective symptoms. The PCS' severity was of mild to high level. These symptoms occurred at initial post injury, within weeks to up to one year. The difference in PCS occurrence and severity was influenced by several factors that were further explained.

Factors related to post concussion symptom experience of persons with mild traumatic brain injury

The Symptom Management Model of Dodd et al. (2001) showed three factors including person, health and illness and environment domain that were related to PCS experience.

Person domain. The person domain consists of age, gender, education level, occupation, and economic level. Some previous studies showed that the influence of this domain on PCS experience was controversial.

Age. PCS was related to the aging process (Beaumont, 2009), and older age might have difficulty to complete organic recovery after injury (King & Kirwilliam, 2011). Some studies mentioned that older age was a factor of developing persistent PCS (Fourtassi et al., 2011; King & Kirwilliam, 2011; McCauley, Boake, Levin, Contant, & Song, 2001). However, other studies reported that age was less significant as a risk factor for developing PCS (Dischinger, Ryb, Kufera, & Auman, 2009; Paniak et al., 2002; Savola & Hillbom, 2003) and was not associated with the PCS severity (Ingebrigtsen et al.,1998).

Gender. Several studies have shown that women had a higher risk of PCS experience. Dischinger et al. (2009) found that gender was a significant predictor of PCS, and women had approximately 2.5 times the risk of men. Furthermore, women were more likely to report their symptom than men (Dean et al., 2012) and have a greater numbers of PCS (Bazarian, Blyth, Mookerjee, He, & McDermott, 2010). Women experience depression twice as much as men which may be because women found it easier to report and express their feelings when they felt depression (Busch & Alpern, 1998). This also could be due to poor coping style in women and societal-influence, and cultural pressures for men to keep their feelings to themselves (Bazarian et al., 2010).

Educational level. Stulemeijer, Vos, Bleijenberg, and van der Werf (2007) found that persons with mTBI who reported cognitive symptoms were significantly more likely to have a lower educational level. The patient's intelligence might also influence their perception of the symptoms (VA/DoD, 2009), which is concerns how they observe the changes that they felt and behave in terms of self reporting symptoms.

Employment. Employment status might be correlated with the PCS. The patients with mTBI who returned earlier to work may have a greater number of PCS which are more severe than those who get enough rest during the recovery phase. This may be with regard to tasks in the workplace that cause the brain to work hard before complete recovery post injury (VA/DoD, 2009). Unemployment status post injury was a factor that influenced development of long term PCS (King & Kirwilliam, 2011).

Economic status. Economic status or financial incentive effects PCS experience. Fourtassi et al. (2011) investigated the relationship between PCS and different aspects of social life and found that the incidence of PCS was higher in persons with a poor socioeconomic background. Similarly, Binder and Rohling (1996) found that persons with low financial incentive more often have abnormalities and disability despite having less severe of injury.

Health and illness domain. Health and illness domain is composed of risk factor, injuries factor and disability and illness factor.

Risk factors. Previous studies found that the negative emotion before injury can be a risk factor of developing PCS, such as anxiety, depression, negative perception, stress, and irritability (Dischinger et al., 2009; Hou et al., 2012). In particular, the patients with mTBI who had pre-injury depression had 3.5 times greater risk of PCS than those who did not report a history of depression (Dischinger et al., 2009).

Injury factors. Injury factors consist of the mechanism of the injury, the injury severity, and several symptoms at initial post injury. Centers for Disease Control and Prevention [CDC] (2003) reviewed the mechanism of injury associated with PCS experience. More symptoms and more severe symptoms might occur because of the severity of the force into the head. The mechanism of injury could be explained by the location of the head injury and the type of force. For example, memory and auditory problems might occur when injury occurs on the temporal area. Visual problems could be associated with occipital area injury. Emotional behavioral and intellectual function might be disturbed when the limbic systems are damaged that are located inside the surface of frontal and temporal area (Gaddes & Edgell, 1994). The force to the head may occur directly (attack directly a specific area on the head) or/and indirectly such as whiplash, that follows an acceleration forward and backwards rapidly. Skull fracture and the finding of serum protein S-100 have become independent early risk factors for developing PCS in patients with mTBI. The force of attack may also help to estimate the injury severity, and the severity of injury has been correlated with the severity of PCS (Savola & Hillbom, 2003).

The severity of injury is usually measured by GCS score, duration of post traumatic amnesia, loss of consciousness, and focal neurological deficit (Len & Neary, 2011). In general, the severity of injury has been associated with PCS occurrence. Savola and Hillbom (2003) found that loss of consciousness and post traumatic amnesia post injury were risk factors of PCS occurrence, while severity of injury was a predictor of cognitive competency impairment (Sveen, Bautz-Holter, Sandvik, Alvsaker, & Roe, 2010).

Early symptoms at initial injury have been usually used to predict PCS and/or long term PCS. Dischinger et al. (2009) collected data at 3 to 10 days and 3 months post injury, then used multivariate regression analysis to determine which early symptoms were the best predictor of persistence PCS. They found that anxiety, noise sensitivity and trouble thinking were the strongest predictors of PCS. In addition, Savola and Hillbom (2003) found that dizziness and headache at admission were early risk factors for developing PCS.

Disability and illness factors. Disability and illness factors refer to disability and illness of pre-post injury. For example, persons used assistive devices (e.g., person used eyeglasses to identify those who have vision problems; person who use walkers have balance problems identified before brain injury event) (Bergman, 2011). For those who have degenerative disease, the symptoms were not only identified as caused by injury, but also because of the history of previous disease (Savola & Hillbom, 2003) such as persons with hypertension who had mTBI may report headache due to both conditions, their medical disease and injury. Moreover, King and Kirwilliam (2011) found that patients with mTBI who had a very high level of PCS and had pre or post morbid factors making the PCS worse at long term period post injury (average of 6.9 years).

Environment domain. The environment domain is composed of physical, social and cultural aspects. The physical environment, such as loud noise and bright light could increase PCS occurrences (CDC, 2007; VA/DoD, 2009). With regard to the working environment such as multitasking and deadlines required a lot of thinking and concentration that could make symptoms worse (American Association of Neuroscience [AANN] & Association of Rehabilitation Nurses [ARN], 2011). In addition, hazards in the workplace were possible causes of additional trauma. The patients with mTBI who suffered additional trauma significantly had more severe PCS (Stulemeijeret et al., 2006). Social environments included social support and interpersonal relationships which were helpful the patients with mTBI to minimize adverse symptoms and help them to be stronger when dealing with situations after mTBI (Bay, Blow, & Yan, 2012). Moreover, some of persons with mTBI experienced psychosocial stress. Psychosocial rules (i.e., community integration, life satisfaction and social support) had negative relationships with PCS experience (Stalnacke, 2007). Other previous studies showed the effect of social support on PCS. For example, low level of social support is associated with greater depression severity (Gabel, 2012), and lowering of belonging sense and low social support can predict post injury depression (Bay et al., 2012). When the psychological problem remains, either before or after injury, it will be a risk to develop PCS (Dischinger et al., 2009; Hou et al., 2012). The cultural environment means an individual belief, value and practice that are influenced by ethnicity, race, and religion (Dodd et al., 2001). Casterline (2006) stated that a relationship with God through praying would provide more comfortable and peaceful feelings and decrease stress and depression, increase emotional competencies, and promote feelings of healing and well-being.

Post concussion symptom assessment of persons with mild traumatic brain injury

There are several tools used to measure PCS experience, such as Rivermead Post Concussion Symptom Questionnaire, the Problem Checklist, and Acute Concussion Evaluation.

The Rivermead Post Concussion Symptom Questionnaire (RPQ). The RPQ is the most common tool to assess PCS experience. It is a specific tool that is used to measure PCS experience in persons with mTBI. This questionnaire was developed by King, Crawford, Wenden, Moss, and Wade (1995). It is composed of 16 symptom items and 2 open-ended questions for additional symptoms if any additional symptoms reported by subjects. Each symptom is assessed by using a 5 point-Likert scale including (0) not experienced at all, (1) no more of a problem, (2) a mild problem, (3) a moderate problem, and (4) a severe problem. The RPQ has been tested for construct validity and reliability. The result showed adequate external construct validity and good test-retest reliability in range value .72 to .89 (Eyres, Carey, Gilworth, Neumann, & Tennant, 2004). The RPQ has been used by several previous researchers to measure PCS in mTBI population, such as Dean et al. (2011), Ingebrigtsen et al. (1998), Lannsjo et al. (2009), Roe et al. (2009), Sigurdardottir et al. (2009), Snell, Siegert, Hay-Smith, and Surgenor (2011), Sterr, Herron, Hayward, and Montaldi (2006), and Stulemeijer et al. (2006).

The Problem Checklist (PCL).The PCL from New York Head Injury Family Interview was used to measure self-report symptoms in TBI population in general including mild, moderate, and severe injuries. This questionnaire was developed by Kay, Cavallo, Ezrachi, and Vavagiaakis (1995). The PCL is composed of 43 items symptom. Each symptom is measured by 5 point-Likert scale score for duration (0 = never to 4 = most day of weeks) and severity level (0 = not severe to 4 = very severe). The PCL has shown the acceptable of face and construct validity. The reliability was tested by internal consistency and showed the Cronbach’s alpha scores ranged from .65 to .87 (Kay et al., 1995). The PCS was used by previous studies, such as Bergman (2011), Paniak et al. (2002), and Kashluba et al. (2004).

Acute Concussion Evaluation (ACE). The ACE is usually used in primary care and emergency settings to record symptoms reported by the persons with

TBI, and can be applied in the pediatric population. It was developed by the Centers for Disease Control and Prevention (Gioia & Collin, 2006). The ACE is composed of 22 symptom items. The components on the ACE form include; (1) characteristics of the injury including mechanism, level of consciousness, and posttraumatic amnesia, (2) signs and symptoms, (3) risk factors for prolonged recovery ,(4) diagnosis of level concussion; and (5) action plan for follow up. This instrument used dichotomous answers, if symptoms were not presented, circle “0” and if symptoms were presented, circle “1”. ACE has good validity testing in terms content, convergence and the construct validity. The reliability of the ACE is shown by internal consistency with Cronbach’s alpha coefficient of .82 (Gioia, Collins, & Isquith, 2008).

Based on the literature review above, the RPQ is a specific tool to measure the PCS of mTBI population in comparison to the PCL developed for assessing symptoms of TBI in general and the ACE for use with the different aged populations. In addition, the RPQ has a fewer items than the RPQ and the ACE so it would take shorter time to complete. The RPQ provides open-ended questions for additional symptoms were reported by subjects. Importantly, the RPQ has also been commonly used by several studies and has shown acceptable reliability. The RPQ matches a specific population, has an appropriate number of items and is reported to be a good quality tool, thus the RPQ was selected for this study.

Post Concussion Symptom Management in Persons With Mild Traumatic Brain Injury

Symptom management is a strategy technique that persons use to relieve their symptoms experience. The goal is to delay or reduce one or more than one symptom. Symptom management strategies are dynamic processes that usually change over time dependent on the persons' experience. Based on the SMM, symptom management refers to the strategies that persons use consisting of: what, why, how, when, where, how much, to whom, how well it works (Dodd et al., 2001).

Several researchers have developed guidelines or interventions for management of symptoms in the persons with mTBI such as pharmacological treatments, physical/activity therapies, education programs, and cognitive-behavioral approaches (Arciniegas, Anderson, Topkoff, & McAllister, 2005; Chong, 2008; VA/DoD, 2009).

Pharmacological treatments. Headache is commonly relieved by using pharmacological treatment (VA/DoD, 2009). Acetaminophen is a better choice for immediate treatment of post concussion headache because using aspirin or other non-steroidal anti-inflammatory drugs immediately after the injury had a risk to induce cerebral hemorrhage (Guskiewicz et al., 2004). Medication usually used to treat fatigue in persons with mTBI function as acetylcholinesterase inhibitors (Khateb, 2005). Pharmacological treatment for sleep disturbance uses Trazadone as the first-line therapy (Arciniegas et al., 2005), tricyclic antidepressants or Modafinil, and Melatonin (Kemp, Biswas, Neumann, & Coughlan, 2004). Whereas, using benzodiazepine hypnotics and antipsychotics to treat sleep disturbance in persons with neurological injury is undesirable due to potential interference with neuronal recovery (Rao & Rollings, 2002). Pharmacological treatment reduces cognitive symptoms, such as alteration of intentions, memory problems; and alteration of executive control, so methylphenidate drugs are usually used (Kaelin et al. as cited in Arciniegas et al., 2005). Pharmacological treatment for affective symptoms (e.g., depression, anxiety, and irritability) may use selective serotonin reuptake inhibitors and tricyclic antidepressants (Arciniegas et al., 2005).

Physical/activity therapy. After mTBI the initial therapy used is taking a rest because getting plenty of rest and sleep helps the brain to heal after injury (CDC, 2003). Moreover, the persons with mTBI need to avoid activities with physical demands (e.g., sports, heavy housecleaning and exercise) or that require a lot of thinking/ concentration (e.g., working on the computer and playing video games) in the acute phase (CDC, 2007). However after two weeks, the patients with mTBI who reported PCS also need to maintain regular exercise because increased physical activity may reduce frequency and intensity of headache (CDC, 2007). Doing massage therapy may help to reduce headache from neck tension (Quinn et al., 2002). Other physical interventions for headache relief are maintaining regular meal schedule and adequate hydration (VA/DoD, 2009). Physical therapies for reducing fatigue were saving energy (e.g., set priorities, delegate, rearrange schedule activities, delay unimportant activities, and naps that do not disturb nighttime sleep), and performing distraction techniques (e.g., playing games, music, reading, and socializing) (Mock, 2001).

Educational program. The education should be provided in the early period post injury. Early education refers to providing information both for persons with mTBI and caregivers or family members about the common manifestations after mTBI and what they can do to manage the symptoms. This activity can prevent the PCS and/or reduce the number of PCS' occurrences, frequency and severity (VA/DOD, 2009). Sleep hygiene education is one example that could be applied to manage headache, nausea, sleep disturbance, vision problems, and affective and cognitive symptoms. Sleep hygiene education includes maintaining regular bedtime and awakening schedules, establishing a usual bedtime routine, and making a comfortable environment (Arciniegas et al., 2005; VA/DOD, 2009).

Cognitive-behavioral approach. Cognitive-behavioral therapy is one of the psychological treatments that are beneficial to patients with mTBI, especially to manage affective symptoms such as anxiety, depression and irritability (Bell et al., 2008; Soo & Tate, 2007). Tiersky (as cited in Soo & Tate, 2007) conducted program cognitive-behavioral therapy, and found the anxiety in the post-treatment group was lower than the control group (no intervention).

Literature review related to post concussion symptom management in persons with mild traumatic brain injury

PCS management refers to the strategies that are used to relive the symptoms. PCS management based on the SMM consists of the identity of strategy (“what”, and “why”), how to develop and establish symptom management strategy (“how”, “when”, “where”, “how much” and “to whom”), and finally how well it works.

Previous researchers have studied what patients do to manage their PCS after mTBI. The patients with mTBI reduced their PCS in several ways by themselves and/or with others’ help. For example, one qualitative study was conducted by Baggerly (2004) on three patients with mTBI, to determine what they did in the recovery phase. Based on the experiences of the three female persons, coping management is one PCS management technique to decrease anxiety and worry and to accelerate recovery. The first woman searched literature about negative factors that influence recovery and received support from friends and family. Using antidepressant treatment was also beneficial to improve cognitive performance. The second woman coped by feeling confident. She managed her physical symptoms by herself and did not seek medical treatment, but sought therapy for emotional distress (phobic reaction while driving) and post traumatic disorder. The last woman complained about the length of recovery from neck pain, and she carried out neck exercise as physical therapy (Baggerly, 2004). Bergman (2011) interviewed 30 patients with mTBI within three months post injury. The results showed that the patients reduced their PCS by performing activities/thoughts, using complementary therapies, doing exercise, promoting nutrition, being prepared and medication. Mostly, the patients performed strategies when they felt bothered due to the symptoms. The frequency of the strategies that the patients used was significantly related to the effectiveness of symptom relief. Mostly, they performed the strategies by themselves (Bergman, 2011).

Moreover, Kliangda (2009) studied headache management in 88 Thai patients within 14 days post mTBI. It was found that the majority of the patients relieved headache by themselves using methods that included getting sleep (27.5%), taking pain drug (25%), taking pain relief and rest (20%), taking a rest (10%), taking pain relief and performing head massage (5%), and listening the song (2.5%). Mostly the patients performed the strategies by themselves and 17.5% patients got help from family members.

Factors related to post concussion symptom management in persons with mild traumatic brain injury

PCS management depends on several factors including person, health/illness, and environment.

Person domain. Personal experiences may impact what strategies the persons with mTBI use to manage their symptoms, such as the effectiveness of the strategies in the past. On other hand, age might influence to their personal experience. Adult persons probably had more experience and ability to perform strategies than children and older people who have limited ability (Bergman, 2011; Dodd et al., 2001). Employment status may also influence PCS management. The majority of persons with mTBI was of working age and expected to return to work early after injury. Return to work could induce PCS, therefore, workers should know how to prevent and/or manage the symptoms effectively, gradually return to activities, and modifying their work schedule (AANN & ARN, 2011). Educational level could indicate the persons understanding about their symptom experiences and ability to obtain information to manage the symptoms, for example, electronic resources that provide many guidelines concerning PCS management (AANN & ARN, 2011).

Health and illness domain. Health and illness domain includes co-morbidity as a factor that will affect symptom management ability because the persons may not have the capacity to initiate symptom management strategies (Dodd et al., 2001). For example, persons with co-morbid psychiatric problems, such as anxiety disorder and depression, may face difficulties in performing management strategies (VA/DoD. 2009).

Environment domain. Environment domain is composed of physical, social and cultural aspects. Physical environment includes home, working place and hospital (Dodd et al., 2001). For example, the patients receive assistance and guidance from health care providers during hospitalization. Those patients, who are discharged, maybe more comfortable and get a lot of rest and enough sleep at night at home (Gioia & Collins, 2006). In addition, it is important to know whether the patients with mTBI stay with another person (family or partner) or alone. This data will supply data concerning social support and interpersonal relationships that may influence coping mechanisms, psychological and social health. Environmental situations, such as availability of recourses can make a difference in whether a person sees a health provider or just get utilizes other resources from their surroundings such as family, friends, internet, etc (Bergman, 2011). Moreover, cultural environment relating to individual belief, value and practice are influenced by ethnicity, race, and religion that may contribute to the method and role of self management (Dodd et al., 2001). For example, the patients with TBI in Taiwan believe that using complementary and alternative medicine, such as traditional Chinese medicine, folk and religious therapies could reduce their symptoms (Gau, Yang, Huang, & Lou, 2011).

Assessment of post concussion symptom management in persons with mild traumatic brain injury

Due to the limitation of knowledge on how patients with mTBI manage symptoms by themselves, a better understanding of what patients are doing to self-manage symptoms is needed (Bergman et al., 2011). Previous research has usually assessed symptom management by interviewing the patients with the open-ended questions (Baggerly, 2004). If each symptom experience was reported, the patients were asked to describe the symptom management in the statements in terms of what, when, where, why, how much, to whom, how, and does it work, following the SMM (Dodd et al., 2001). Recently, the Symptom Self-management Scale for TBI (SSMS-TBI) was developed by Bergman et al. to know how the persons with mTBI are able to manage their symptoms and evaluate self-management.

The SSMS-TBI was adapted for TBI and is a revised version of the Self-Care Symptom Management for people living with HIV/AIDS questionnaire. This SSMS-TBI is directed at common symptoms for persons with mTBI that includes items on headache, dizziness, fatigue, memory difficulties, anxiety, and depression. Each symptom is available on one form or checklist to explore what kind of strategies, how often and does it work to reduce their symptoms. Every kind of management strategy will be assessed using "how much/how often" on five levels including (0) not used, (1) rarely used, (2) monthly, (3) weekly, (4) daily, and (5) several times per day. In addition, to access how it works, five levels were used for measurement including (0) never, (1) rarely, (2) sometimes, (3) often, and (4) always. This scale also has an available empty space to add more strategies utilized by the subjects.

This scale for SSMS-TBI was pilot tested with persons with mTBI (n = 14) and healthy controls (n = 14) to differentiate the responses between groups (mTBI and controls) and test the ease of use of the scale. Cronbach's alpha was measured to assess internal consistency of the measurement. The results showed that there was a significant difference between the mTBI group and control group (*p* < .001). The six parts of SSMS-TBI questionnaire's had alpha coefficients ranging from .76 to .99 (Bergman et al., 2011).

In this study, the researcher used the SSMS-TBI to evaluate the PCS management because it was supported by an expert in the field of mTBI and showed good quality results in reliability test.

Quality of Life in Persons With Mild Traumatic Brain Injury

The SMM stated outcomes as the third variable of symptom dimensions (Dodd et al., 2001). The outcomes could be assessed in several ways, and one of the ways used to evaluate the subject's satisfaction about their health was by using the term "quality of life (QoL)".

Initially, the definition of QoL is a broad concept. WHO (1997, *p*.1) defined the QoL as "Individuals' perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectation, standards and concerns". Furthermore, QoL has been introduced in medicine practice and research. Health is a significant dimension of Qol. Thus, health-related quality of life is a crucial indicator that can help reveal the health outcomes (Dodd et al., 2001).

Previous studies define QoL by using two components. Its definition has a construct of (1) what is measured and (2) what are the domains that are measured. QoL (type 1) was used in subjective report to measure aspects of persons' lives such as the satisfaction (Rannsetad et al. as cited in Church, 2004), subjective well being, functioning and health condition (von Steinbuchel et al., 2005), ability and expectation (Church, 2004). The major domains in QoL (type 2) generally consist of physical, psychological, social, and environment (Skevington, Lotfy, & O'Connell, 2004; WHO, 1997).

In the TBI population, the domain of QoL was more specific in terms of cognitive impairment caused by neurological injury. Cognitive impairment affects the persons' ability to cope with their conditions after injury and influence the persons' satisfaction of the current situation and future prospects (von Steinbuchel et al., 2010). Therefore, the QoL in TBI population refers to the subjective well-being, functioning and health condition in the physical, cognitive, emotional, social and daily life domains (Carlozzi et al., 2011; Fallowfield, 2009; von Steinbuchel et al., 2010). Recently, von Steinbuechel et al. (2012) provided a specific profile of QoL for the TBI population in domains typically affected by satisfaction including (1) physical condition, (2) cognition, (3) emotion, (4) function in daily life, (5) personal and social life, and (6) current situation and future prospect. These domains were used in this study to measure the QoL in persons with mTBI as one of the symptom outcomes of SMM.

Literature review related to quality of life in persons with mild traumatic brain injury

Previous researchers examined the QoL in persons with mTBI at different times post injury (one week to 10 years) by using different tools (e.g., the SF-36 Health Survey, A Brief Version of The World Health Organization Quality of Life Questionnaire [WHOQOL-BREF], and simple Visual Analog Scale). Their findings showed various levels of QoL. Ponsford et al. (2011) conducted a longitudinal study with 123 patients from hospital admission to follow up at one week and three months post mTBI. They found that the majority of patients had a lower level of QoL at one week; and the level of QoL was improved at three months post injury. Moreover, the cross sectional studies were done in persons with mTBI and showed various level of QoL. For example, Zhang et al. (2009) found that most subjects within three months post mTBI had a fair (40.3%) and poor (30.5%) of QoL level. On other hand, Kliangda (2009) found that the patients with headache within14 days post mTBI reported a moderate to high level of QoL. Three other studies that followed up at 1 to 10 years post mTBI found that most of persons with mTBI commonly had moderate to high level of QoL (Beseoglu et al., 2012; Fourtassi et al. 2011; Zumstein et al., 2011).

Moreover, regarding the score of each domain of QoL, physical domain was mostly reported with the lowest score comparison in relation to the other domains (e.g., cognitive, emotional, social, environment and functional domain) (Beseoglu et al., 2012, Kliangda, 2009, Ponsford et al., 2011). Social relationship and environment domain were reported at a high level of satisfaction (Kliangda, 2009). Functional domain score was also improved when compared to the baseline score and follow up at three months post mTBI (Ponsford et al., 2011).

Factors related to quality of life in persons with mild traumatic brain injury

The SMM explained that the person, health and illness, and environment domain influenced QoL (Dodd et al., 2001). The influence of each domain on QoL was discussed as follows:

Person domain. Age, gender, socioeconomic, and education level were discussed which can influence the recovery and the QoL of persons with mTBI.

Age. In order of the age, young adult (18-24 years) reported better of rating their health than older age (45-94 years) (Zhang et al., 2009). Despite having similar GCS with young adult, older age more likely reported low level of QoL and experienced a poor recovery (Goldstein, 2005), such as functional recovery (Greenberg, 2006; King & Kirwilliam, 2011; Mosenthal et al., 2004).

Gender. Some studies found that gender was associated with QoL as females significantly had poorer QoL than males (Snell et al., 2011), and slower recovery (Bazarian et al., 2010; Carroll et al., 2004). Bazarian et al. (2010) indicated the poor recovery in females was due to interference of endogenous estrogen or progesterone production during childbearing years and the reducing of the neuro-protective effects of these hormones.

Socioeconomic status and education level. Socioeconomic status and education level influence QoL in persons with mTBI. Low socioeconomic status was related to psychological stress, low expectation to recover after injury, and low satisfaction of QoL afterwards (Bay & Liberzon, 2009; Stulemeijer, van der Werf, Borm, & Vos, 2008). In addition, the persons with high educational level had a chance for good recovery after injury and had good satisfaction of QoL (Snell et al., 2011; Stulemeijer et al., 2008). Perhaps, high education might make the persons with mTBI more aware and having higher expectations of themselves to cope and manage their health problems, including the signs and symptoms and/or the impact of the mTBI (Snell et al., 2011).

Health and illness domain. Health and illness domain is composed of risk factors, injuries factors and disability and illness factors.

Risk factors. The patients with mTBI without good active coping had higher possibility of emotional impact or affective symptoms post mTBI. The patients with affective symptoms had significantly greater probability of poor outcomes at three months and had a risk for slow recovery (Snell et al., 2011). Anson and Ponsford (2006) stated that a patient's ability to cope with a change in brain function after brain injury is shown to be an important factor in recovery and QoL. Tomberg, Toomela, Pulver, and Tikk (2005) reported that coping strategies, satisfaction with social support, and optimistic life orientation were associated with resuming work and QoL of patients post injury.

Injury factors. Injury factors such as the characteristics of injury event including the mechanism and severity of injury were associated with the QoL. The characteristics of injury event had significantly greater probability of poor recovery at three months (Snell et al., 2011). Mechanism of injury, motor vehicle crashes and assaults are associated with a higher number of PCS which influences the recovery phase after mTBI and the satisfaction with QoL (Bazarian & Atabaki, 2001; Emanuelson, Andersson, Bjorklund, & Stalhammar, 2003). Zumstein et al. (2011) found that patients with intracranial injury had almost half the level of QoL of patients without intracranial injury. Additional injuries also limit physical functioning and lower return to work, most likely reflecting slower physical recovery and low QoL (Stulemeijer et al., 2006).

Disability and illness factors. High numbers of PCS occurrences had significant correlation with lower QoL post mTBI (Emanuelson et al., 2003). Other studies found that specific symptoms induced low level of QoL, such as predominance of fatigue and cognitive impairment (Lannsjo et al., 2009), post concussion depressive and sleep disturbance (Zhang et al., 2009). Persistent symptoms also affected low QoL as long as 10 years after injury (Zumstein et al., 2011).

Environment factors. Environment domain is composed of physical, social and cultural environments. The physical environment, such as light affects the production of melatonin. Melatonin has significant effects in neuro-protective outcome. Environment with low light or darkness induces elevation in endogenous melatonin secretion. In contrast, bright light will effect development of PCS due to decreasing melatonin production (Ucar et al., 2005). Despite physical environment, social and cultural environment also effect to QoL for persons with mTBI. Family support forms part of the social environment. Good family support contributes to good level of QoL (Fourtassi et al., 2011). In Indonesia, family relationships and family support remain high which is shown as the majority live in an extended family (www.countryreports.org). Relatives' often visit each other, especially when the one of family member get sick or is injured (Higgins & Higgins as cited in Goodwin & Giles, 2003). Religion also forms part of the social environment. Islam as the religion of the majority of Indonesian persons, teaches and guides the Ummah (Muslim community) to uphold brotherhood and build close relationships, with both fellow family members and fellow Muslims, called *silaturrahim* (visit each other) (Al-Qur'an, Q. S. Al-Anisaa: 1). Thus, the persons with mTBI who had good interpersonal relationships including family and social support and practice religion in their daily life may have greater life satisfaction in terms of their QoL, especially in the personal and social life domains (Bay et al., 2012; Stalnacke, 2007).

Quality of life assessment in persons with mild traumatic brain injury

There are several tools used to assess QoL, including the general tools and specific tools for the TBI population. General tools are used to measure the QoL in the general population, such as Short Form (SF-36) Health Surveys, and a brief version of the World Health Organization Quality of Life Questionnaire (WHOQOL-BREF). Recently, two specific assessment tools have been used to measure the QoL in persons with TBI, including the Quality of Life after Traumatic Brain Injury (QOLBRI) and the Quality of Life after Traumatic Brain Injury Overall Scale (QOLBRI-OS) as the brief of QOLIBRI Questionnaire.

The SF-36 Health Survey. The SF-36 health survey is one of most popular questionnaires to measure QoL. This questionnaire was developed by Ware and Gandek (1998). It is composed of 36 item questions including physical health and mental health sections. The physical health section consists of physical function (10 items), role of physical (4 items), bodily pain (2 items), general health (5 items) and health transition (1 item). The mental health part consists of vitality (4 items), social functioning (2 items), emotional role (3 items), and mental health in general (5 items). The reliability of this tool was measured based on a summary of 15 studies and surpasses .80 (Ware & Gandek, 1998). This tool has been used with several populations including healthy people, several types of subjects, and the mTBI population (Beseoglu et al., 2012; Bunkong, 2009; Emanuelson et al., 2003; Paniak et al., 2000; Ponsford et al., 2011; Zhang et al., 2009).

A brief version of the World Health Organization Quality of Life Questionnaire (WHOQOL-BREF). The WHOQOL-BREF is modified from the

WHOQOL that was developed in 1991. The WHOQOL-BREF is comprised of 26 items, including global items, physical health, social relationship and environment. The WHOQOL-BREF is available in English, Indonesian, Chinese, Farsi, Polish, Russian and Thai versions (WHOb, 2012). It has been used to measure QoL of both healthy and sick persons. This questionnaire also was tested with 354 patients with TBI and showed good internal consistency (.75 - .89) and test-retest reliability (.74 - .95) (Chiu et al., 2006). The Thai-version of this tool was used measure the QoL in persons with mTBI and its reliability was .91 (Kliangda, 2009).

The Quality of Life after Brain Injury (QOLIBRI). The QOLIBRI was developed by von Steinbuchel, et al. and the QOLIBRI Task Force (2010) and was a disease-specific measurement scale to assess QoL of patients after TBI. The QOLIBRI is composed of two parts with a total of 37 items across six sub-scales. The first part evaluates level of satisfaction within four domains: cognition (7 items), self (7 items), daily life and autonomy (7 items), and social relationships (6 items). The second part asks subjects how "bothered" they are in two domains: emotions (5 items) and physical problems (5 items). Each item is scored on a 5 point-Likert scale. The QOLIBRI is available in several languages (e.g., Dutch, English, Finnish, French, German, and Italian) and meet standard psychometric criteria. It has been tested for internal consistency and showed Conbrach's alpha score in range .75 to .89 and test-retest reliability score in range .78 to .85 (von Steinbuchel et al., 2010).

The Quality of Life after Traumatic Brain Injury Overall Scale (QOLIBRI-OS). The QOLIBRI-OS was developed by von Steinbuchel et al. (2012). The QOLIBRI-OS is a brief questionnaire parallel with the 37 items in the QOLIBRI. Although the QOLIBRI-OS only consists of six items, the item questions represent the six domains of QoL. The six domains are physical condition, cognition, emotions, daily life, personal and social life, and current situation and future prospect. Each item was assessed by using a 5 point-Likert scale. The QOLBRI-OS is available in six languages (Dutch, English, Finnish, French, German, and Italian) has good validity (Cronbach's alpha was .86) and test retest reliability yielding a value of .81. The QOLIBRI-OS highly correlates with the total score of the full QOLBRI scale (*r* = .87) (von Steinbuchel et al., 2012).

In this study, the QOLIBRI-OS questionnaire was used to measure QoL of persons with mTBI because it was developed to assess the consequences of health conditions for QoL specifically in TBI population. Importantly, the QOLOBRI-OS has cognitive domain as the main aspect which is directly affected by TBI. Condition-specific QoL instruments may be more sensitive to specific health conditions. Therefore, it allows the collection of information that is more focused and precise. In addition, QOLIBRI-OS has a useful psychometric test and is a brief questionnaire which takes a short time for data collection.

Conclusion

TBI is one of the most common causes of disability and death worldwide. From all types of severity level of TBI, mild TBI has the highest incidence of TBI cases. Although mTBI does not threaten a persons' life, it affects their health problems called post concussion symptoms. PCS experience includes physical, cognitive and affective symptoms. PCS happen and are recovered within one to three months after injury which is regarded as the acute period. Longer than three months is regarded as the chronic period for persistent symptoms. The occurrence of PCS leads the persons with mTBI to manage the PCS by themselves or seek help from others. These consequences may have a major impact on the satisfaction of QoL. Previous research has shown different levels of QoL may be caused by several factors.

Previous studies about the PCS experience, PCS management, and QoL in persons with mTBI were mainly carried out in western countries. However, their findings may not completely reveal the PCS experience, PCS management, and QoL in persons with mTBI in Indonesia. As the SMM (Dodd et al., 2001) stated that person, health/illness, and environment factors influence symptom experience, symptom management, and outcomes. Therefore, the differences between Indonesia and western countries of socio-culture, beliefs and religion, and health care system might cause the persons with mTBI to think and deal with their symptoms differently. Moreover, current knowledge about PCS experience, PCS management, and QoL in Indonesian persons with mTBI is scarce. Thus, it is important to study PCS experience, PCS management, and QoL of persons with mTBI in order to provide baseline data for health care providers to develop programs of PCS management related to the contexts in Indonesia.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the research methodology including setting, sample, instruments, ethical considerations, data collection methods, and data analysis.

Setting

This study was conducted in a community setting in Aceh Province, Indonesia. Aceh province is located on Sumatera Island, with 33 districts and 25 government hospitals, of which 2 hospitals are “A” level, 4 hospitals “B” level, 15 hospitals “C” level, and 4 hospitals “D” level.

Regarding the criteria based on the regulations of Ministry of Health Indonesia number 340/MENKES/PER/III/2010, there are four levels of hospitals, including levels A, B, C, and D. The criteria of classification of hospitals at level A are having facility and capability to provide at least 4 basic specialized medical services, 5 specialized supporting medical services, 12 other specialized medical services and 13 sub-specialized medical services. The criteria of classification of hospitals at level B are having facility and capability to provide at least 4 basic specialized medical services, 4 specialized supporting medical services, 8 other specialized medical services, and 2 sub-specialized medical services. The criteria of classification of hospitals at level C are having facility and capability to provide at least 4 basic specialized medical services, and 4 specialized medical centers. The criteria of classification of hospitals at level D are having facility and capability to provide at least 2 basic specialized medical services (Department of Health Aceh Province, 2010).

Banda Aceh city is the capital city of Aceh province. Population density in the city of Banda Aceh has reached 3,725 person/Km^2, which is the highest among districts in Aceh. Total population density in Aceh was only 79 person/Km^2 in 2011 (Ministry of Health, Indonesia, 2011). In addition, Banda Aceh is government and economic center, and the location of a referral hospital (Figure 1).

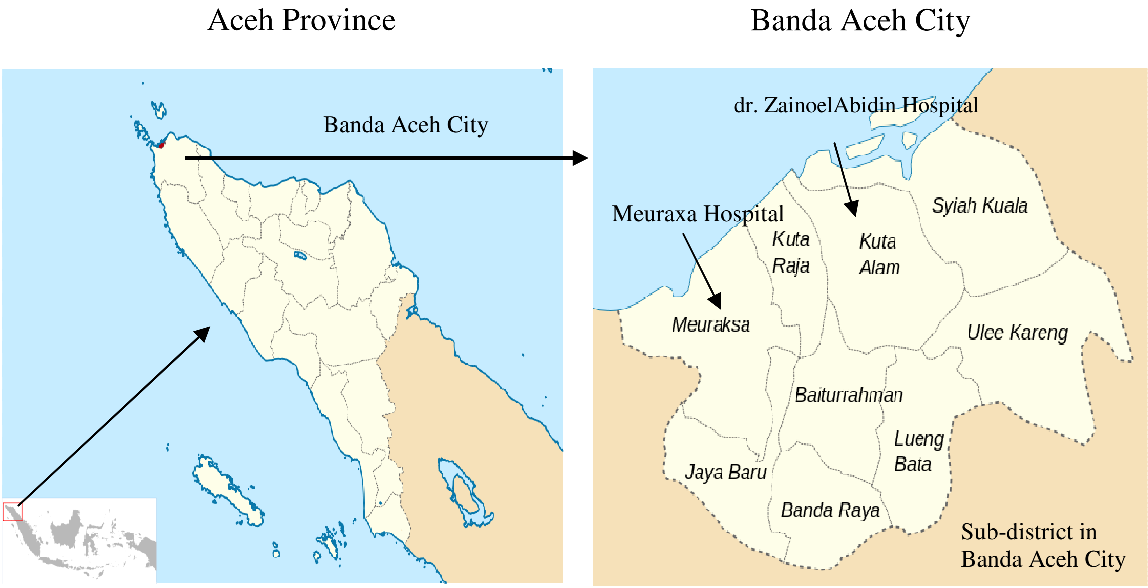

*Figure 1.*Map of Banda Aceh City, Aceh Province in Indonesia

dr. Zainoel Abidin (level A) is a referral hospital for all districts in Aceh Province. There are three other government hospitals, Meuraxa Hospital (level B), Ibu dan Anak Hospital (specialty for mother and child) (level B) and Mental Health Hospital (Level A); two Military Hospitals, including Iskandar Muda Military hospital (level C) and Bayangkara Hospital (level C), and several private hospitals (level C).

In this study, four hospitals were initially proposed to be the study setting; two government hospitals and two military hospitals. However, from the four hospitals proposed, only two government hospitals gave approval, which were dr. Zainoel Abidin Hospital and Meuraxa Hospital. The two military hospitals did not give approval for conducting the study because of regulations and incomplete subject data. Finally, only two government hospitals were included in the study.

The standards of care treatment for persons with mTBI for both the dr. Zainoel Abidin Hospital and Meuraxa Hospital were similar. At emergency department (ED), the persons who had GCS 13-15; history of loss of consciousness; moderate to severe level of headache; amnesia and additional trauma were hospitalized for three days. All hospitalized persons were required a check up at outpatient department (OPD) seven days after discharge. However, for persons who had GCS of 15; minimal level of headache; no history of loss consciousness; no nausea/vomiting; no amnesia and no additional trauma, were observed for six hours in the ED. After six hours, the persons with mTBI will be discharged if their neurological functions are stable. Additional assessment such as brain CT-Scan were only performed when the persons with mTBI showed specific symptoms such as focal neurologic deficit, vomiting, were aged more than 60 years old, post traumatic seizure, deficit in short term memory and suspected skull fracture.

Before patient’s discharge from the ED/ hospital, the health care provider gave verbal information regarding neurological abnormalities, such as drowsiness, nausea and vomiting, seizure, fluid or blood discharge from ear or noise, severe headache, confusion, weakness and numbness in extremities. If these conditions occur, patients are required to return to the hospital as soon as possible. In addition, the patients should take rest and prevent for repeated head injury. They get home medications for three to seven days after discharged. The pharmacological treatments based on patients condition and complaint, such as the patients who reported headache and dizziness after injury, such as Flunarizin to treat headache and dizziness; analgesics (e.g., Paracetamol, Ibuprofen) to reduce pain; and sedative (e.g., Amitriptilin, Diazepam) to help them relax and decrease the work of brain.

Sample

The population in this study was persons with mTBI who were admitted at dr. Zainoel Abidin Hospital and Meuraxa Hospital. The subjects were recruited with the following inclusion criteria: (1) age ≥ 18 years old, (2) diagnosed with mTBI and GCS score 13-15 in ED, (3) had a history of mild head injury for at least two weeks, (4) had no psychiatric illness, neurological disorder (e.g., epilepsy, mental retardation, stroke, paraplegia, and quadriplegia), and (5) was able to understand Indonesian and local language.

Sample size. The population of this study was persons with mTBI who were admitted at dr. Zainoel Abidin Hospital (583 cases) and Meuraxa hospital (304 cases) in the year 2012, a total of 887 subjects. The sample size was determined based on the proportional sample of descriptive studies. For the population number less than 1000, the proportional sample size is 25% of the population (Singchangchai, 1986, *p.* 141). Thus, 221 subjects could be the sample size of this study, with the proportional sampling of 145 subjects from dr. Zainoel Abidin hospital and 76 subjects from Meuraxa hospital. However, 136 subjects (61.5% of the sample size) participated in the actual study due to the incompletion of telephone contact information for a follow-up. One hundred subjects were recruited from dr. Zainoel Abidin hospital and 36 subjects from Meuraxa hospital.

Instrumentations

The instruments used in this study were composed of four parts to measure subjects' characteristic, PCS experience, PCS management, and QoL in persons with mTBI.

Part 1 Demographic and health-related data form. This form consisted of two parts. The first part aimed to assess demographic data including the time of injury, age, gender, marital status, religion, educational level, occupation, family income, medical payment, and living arrangements. The second part aimed to assess health-related data including cause of brain injury, type of injury (laceration or swelling), the area of injury, additional injuries, medical history, current medications related to medical disease, and other neurological injury variables (including GCS, confusion/disorientation, loss of consciousness for 30 minutes or less, amnesia for less than 24 hours, and other neurological abnormalities). The researcher obtained health related data from medical records, including the type of injury, area of injury, additional injury, medical history, current medications and injury variables (i.e., GCS, confusion/disorientation, loss of consciousness, amnesia and other neurological abnormalities). Moreover, some data were obtained directly from the subjects when the researcher could not find them in their medical record, such as the cause of brain injury, area of head injury, medical history, and current medications) (Appendix B).

Part 2 The Rivermead Post Concussion Symptoms Questionnaire (RPQ). The RPQ was developed by King and colleague (1995). The RPQ consists of 16 symptoms and open-ended questions for subjects' additional symptom based experiences. The original RPQ asked the subject to compare their condition before the injury and now (e.g., over the last 24 hours) about suffering from symptoms and rate the degree of the symptoms, using a five point-Likert scale as follows: 0 = not experienced, 1 = no more of a problem, 2 = mild problem, 3 = moderate problem, and 4 = severe problem.

The researcher modified the questionnaire as required according to the conceptual framework of the SMM by Dodd et al. (2001). The symptoms were assessed for occurrence, frequency and severity. The RPQ was also modified in part of the direction and the scale. The researcher asked the subjects to report the PCS experience over the previous week from data collection time. The occurrence was accessed using a "yes/no" checklist, if the subjects chose "yes", then the frequency and severity of the symptoms were measured further. The frequency and severity of the symptoms were measured by Likert scale. The frequency was rated on a 4 point-Likert scale as follows: 1 = rarely, 2 = a little (1-2 days/week), 3 = occasionally (3-4 days/week), and 4 = most of the time (5-7 day/week). The severity of PCS was rated on a 5point-Likert scale as follows: 0 = not severe, 1 = slightly severe, 2 = moderately severe, 3 = severe and 4 = very severe (Appendix C). For interpretation, the means of the frequency score were categorized in three levels as follows: few (1.00 - 2.00), occasionally (2.01 - 3.00), and most of the time (3.01 - 4.00). The means of the severity score were categorized in three levels as follows: not severe (0 - 1.00), slightly (1.01 - 2.00), moderate (2.01-3.00), and severe (3.01 – 4.00).

Part 3 The Symptom Self Management Scale adapted for TBI (SSMS-TBI). The SSMS-TBI was developed by Bergman et al. (2011). The SSMS-TBI is used to assess the PCS management strategies of the persons with mTBI. There are six symptom forms, i.e., headache, dizziness, fatigue, thinking/memory difficulties, anxiety/restlessness, and depression. The thinking/memory difficulties form was used to assess the strategies of the subjects who had one or more of three cognitive symptoms, i.e., forgetfulness, poor concentration and taking longer to think symptoms. For each of the symptom complaints, the subjects indicated the frequency and the effectiveness of each management strategy that they used.

The researcher modified the scale in the frequency section of this questionnaire. The original questionnaire rated the frequency on a 6 point-Likert scale as follows; 0 = never used, 1 = rarely used, 2 = monthly used, 3 = weekly used, 4 = daily used, and 5 = used several times per day. As the subjects were asked about their symptom management in the previous week, thus the scale for the frequency part was changed to a 4 point-Likert scale as follows: 0 = never used, 1 = rarely used (1-2 days/week), 2 = occasionally (3-4 days/week), and 3 = most of the time (5-7 day/week). Moreover, the effectiveness scale was the same as the original, rated on a 5 point-Likert scale as follows: 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always (Appendix D). The interpretation of the effectiveness of management strategies were categorized in three levels as follows: low (0 – 1.33), moderate (1.34 – 2.66), and high (2.67 – 4.00).

In addition, the questionnaire provided blank space for the additional strategies the subjects used to manage the symptoms, as well as the other symptoms that were not listed in the items of management strategies. The researcher also added additional questions related to the strategies that subjects' reported, including the reason (why), the way (how), when, who helped the subject to perform the strategies, and the place (where) the strategies were conducted. These additional questions were required to fulfill the management strategies component based on the SMM (Dodd et al., 2001).

According to the validity of the instruments, the experts suggested deleting two options from the strategies (street drug and marijuana) on "substance use" group. These two strategies were prohibited and may not be suitable for Muslim people and culture in Aceh Province, as using street drugs and marijuana are criminal offenses.

According to translation of the instruments, the first translator suggested to changing the word "meditation" to "*Dzikir*", because it is a term commonly used by Muslims (religion and culture). Muslims never do meditation, although the way in which they perform the activity is different, the goal is almost identical.

Part 4 The Quality of Life after Brain Injury Overall Scale (QOLIBRI-OS). The QOLIBRI-OS was developed by von Steinbuchel et al. (2012). It measures the overall satisfaction of persons with mTBI in the previous week and now related to six dimensions including (1) physical condition, (2) cognition, (3) emotions, (4) function in daily life, (5) personal and social life, and (6) current situation and future prospect. It was rate on a 5 point-Likert scale as follows: 1 = not satisfied at all, 2 = slightly satisfied, 3 = moderately satisfied, 4 = quite satisfied and 5 = very satisfied (Appendix E).

The QOLIBRI-OS total score was interpreted by using the mean and standard deviation (*SD*). In testing, the total score of QOLIBRI-OS met the criteria for normal distribution. The score is categorized as low level of QoL if the score is less than mean – 1 *SD*, moderate level if score is in the range mean ± 1 *SD*, and high level if the score is higher than mean + 1 *SD* (Polit & Beck, 2008, *p.* 388). The data show that the mean was 3.73 and *SD* was 0.76 (Table 14). In conclusion, low level of QoL if the score is < 2.97, moderate level if the score is in the range 2.97- 4.49 and high level if the score is > 4.49.

Quality of the instruments

The instruments used in this study were tested for validity and reliability. The process of testing the instrument quality consists of three steps. Firstly, the instruments were content validated. Secondly, translating processes were conducted. Finally, the questionnaires were tested for reliability.

Validity of the instruments. The contents of four instruments were validated by three experts. The first expert was a neurosurgeon, and the second expert was an advanced practitioner nurse who has worked in a neurosurgical intensive care unit at a tertiary hospital. The third expert was a lecturer in the Surgical Nursing Department, Faculty of Nursing, Prince of Songkla University (Appendix F). Then, the researcher and thesis advisor's revised the contents based on the experts' recommendations.

Translation of the instruments. The original instruments RPQ, SSMS-TBI and QOLIBRI-OS were in English language. They were translated into

Indonesian language through a back translation technique with the help of three bilingual translators who translated these instruments to ensure the accuracy of the translation and identify discrepancies between the two versions. The process of translation was performed or checked for cultural relevance in an Indonesian context based on Hilton and Skrutkowski (2002) as follows:

Step 1: The first translator was an Indonesian master nurse lecturer who translated the instruments from English into Indonesian language (version 1). She understands English language well, and graduated from Prince of Songkla University, Thailand. She is a senior lecturer in the Medical Surgical Department in Syiah Kuala University, Aceh, Indonesia.

Step 2: The second translator translated the Indonesian version document back into English (version 2). She is an expert in English language and provides services for translation and editing for journal/writing.

Step 3: The third translator was the major advisor who evaluated both the original English (version 1) and the translation back into English version (version 2) to ensure the equivalence of the two versions and to maintain the quality of language and cultural validity. There were some discrepancies between version 1 and 2, such as the symptoms in the RPQ “taking longer to think” and “requiring a long time to think”; “easily upset by loud noise” and “easily irritated by loud noise”. In the SSMS questionnaire, such as “talk myself through it” and “talking to oneself about things in mind”; “keep busy” and “immerse oneself in work”. Then, the researcher kept the version 1.

Reliability of the instruments. The Indonesian version of the RPQ, the SSMS-TBI and the QOLIBRI-OS was tested for reliability with 20 persons with mTBI. The stability of the RPQ and the SSMS-TBI were analyzed by using test-retest reliability. The lengths of time between first and second interviews were three days. The intraclass correlation coefficient (ICC) was used, yielding a value of .92 for the RPQ. Moreover, the ICC of SSMS-TBI questionnaire that included headache, dizziness, fatigue, memory/thinking difficulty, anxiety and depression questionnaire yielded values of .90, .77, .77, .86, .86, and .82, respectively. The internal consistency and reliability was tested using QOLIBRI-OS with the Cronbach's alpha coefficient yielding a value of .91. Furthermore, the QOLIBRI-OS was tested for the internal consistency from all subjects' data set. The result showed the Cronbach's alpha coefficient for this questionnaire to be .99.

Ethical Considerations

This study was approved by the Research Ethic Committee of Faculty of Nursing, Prince of Songkla University, Thailand (Appendix J), and permission for data collection obtained from the Directors of the selected hospitals (Appendix K). Additional approval was obtained from the Head Nurse of ED and IPD, as well as the Head of the Medical Record Unit. The researcher explained the purpose of the study to eligible subjects. Subjects who expressed interest in to participating in the study provided oral or written consent (Appendix A). Then, the subjects received further explanation about the study. They were informed that they had the right to stop or withdraw from the study for any reasons without fear of any negative consequences. The researcher used a coding system to identify the subjects to ensure the subjects anonymity and the confidentiality of all information. After the subjects signed the informed consent or confirmed consent orally, the researcher started collecting the data.

This study used existing questionnaires after the researcher had obtained the necessary permission including RPQ, SSMS-TBI and QOLIBRI-OS. The researcher used e-mail to request permission and statements of approval are attached in appendices G, H and I.

Data Collection Method

Data collection in this study was performed as follows:

1. After receiving approval from the Research Ethic Committee of Faculty of Nursing, Prince of Songkla University in Thailand and the Directors of the two hospitals in Banda Aceh City, the researcher introduced herself to the Head Nurses at IPD, ED and the Head of the Medical Record Unit to request permission and execute the informed consent process for data collection.

2. The researcher reviewed the medical records of the subjects who met inclusion criteria from that unit, IPD/ED including the subjects' address, family telephone number, demographic, and health related data.

3. For previous subjects who had mTBI from January to December 2012, the researcher telephoned the subjects' family, provided a description of the objectives of this study and the subject's human rights. After the subjects' family had consented, the researcher asked permission to approach the subject. In new cases, persons with mTBI who were admitted at ED/IPD from January to March 2013, the nurses at ED/IPD introduced the researcher to the subjects directly.

4. The researcher introduced herself and described the objectives of this study, and the subjects' human rights to the subjects. They were able to withdraw from the study at any time without it effecting their medical treatment. They were advised that their information was to remain confidential at all times.

5. After the subjects provided oral/written consent, the researcher made an appointment for an interview at least two weeks post mTBI.

6. The researcher interviewed 136 subjects that consisted of 131 subjects via telephone, and five cases face to face at their workplaces. From the 131 subjects interviewed by telephone, 100 subjects gave available times for interview during their working day. The time for completion of questionnaire ranged from 15 to 90 minutes. During data collection, approximately 90 subjects asked to postpone the interview because of interruption of their work. Data collection resumed when they were ready and willing to continue the interview.

7. The researcher checked the completion of the questionnaires.

Data Analysis

The researcher initially screened and cleaned the dataset for missing and errors of data entry. The descriptive statistics were used to analyze PCS experience, PCS management, and QoL. These included frequency, percentage, mean (*M*) and standard deviation (*SD*) for normally distributed continuous data, and median (*Mdn*) and interquartile range (*IQR*) for non-normally distributed continuous data. The data for open-ended questions were tallied and the number of the subjects were summarized (e.g., the reason of using the PCS management strategies).

CHAPTER 4

RESULTS AND DISCUSSION

This descriptive study was conducted to identify the PCS experience, PCS management, and quality of life in Indonesian persons with mTBI. The results and discussion of this study were presented in four parts as follows: (1) Demographic and health-related data, (2) PCS experience, (3) PCS management, and (4) Quality of life in persons with mTBI.

Results

Demographic and health-related data

The findings of this study were derived from 136 subjects. The majority of the subjects were in the age range 18 - 30 years old (60.3%), with a median of 27 years. There were a comparable number of subjects of each gender. Nearly half were single (48.5%). All of the subjects were Muslim. More than half were educated at college level (53%) and were working (55.9%). The majority of subjects lived with their family (81.6%) (Table 1).

Table 1

Frequency and Percentage of the Subjects Classified by Demographic Data (N = 136)

Characteristics	*n*	%
Age (year) (*Mdn* = 27, *IQR* = 18, *Range* = 18 - 65)		
18 – 30	82	60.3
31 – 40	22	16.2
41 – 50	18	13.2
≥ 51	14	10.3
Gender		
Female	69	50.7
Male	67	49.3

Table 1 (continued)

Characteristics	*n*	%
Religion		
Islam	136	100
Marital status		
Single	66	48.5
Married	62	45.6
Widowed and divorced	8	5.9
Educational level		
Primary school	1	0.7
Secondary school	63	46.3
College (i.e. Diploma, Bachelor, and Master)	72	53.0
Occupation status		
Worker	76	55.9
Private employee	(37)	(48.7)
Government officer	(23)	(30.3)
Agricultural worker	(8)	(10.5)
Personal business	(8)	(10.5)
Student	36	26.5
Housewife	23	16.9
Retired	1	0.7
Family Income (Rupiah/month)*		
<1,350,000	23	16.9
1,350,000 – 2,500,000	86	63.2
> 2,500,000	27	19.9
Medical payment		
Government insurance	114	83.8
No insurance	18	13.2
Private insurance	4	3.0
Living arrangements		
With family	111	81.6
With friend	17	12.5
Alone	8	5.9

Note. * 1 USD = Rupiah 9,734

Table 2 shows the health-related data of the subjects. The subjects had mTBI for 2 to 60 weeks with a median of 13 weeks (*IQR* = 24). The majority of them had mTBI caused by motorcycle accident (88.3%), and had laceration wound of the head (54.4%). On ED admission, three-quarters of the subjects scored 15 on the GCS (76.5%). A half of the subjects (50.7%) had a head injury in the temporal area.

Approximately one-third of the subjects (30.1%) had additional injuries on their bodies, such as fracture of the extremities, dislocation of the joints, skin laceration, and blunt chest trauma.

Table 2

Frequency and Percentage of the Subjects Classified by Health-Related Data (N=136)

Characteristics	*n*	%
Period post mTBI (week) (*Mdn*= 13, *IQR* = 24, *Range* 2 – 60)		
2 - 12	67	49.2
13 – 60	69	50.8
Cause of mTBI		
Motorcycle accident	120	88.3
Sport injury	12	8.8
Fall	3	2.2
Assault	1	0.7
Type of head injury		
Laceration	74	54.4
Swelling	62	45.6
Sign and symptom at ED admission		
Score on the GCS		
15	104	76.5
14	17	12.5
13	15	11.0
Confusion/disorientation		
Yes	86	63.2
No	50	36.8
Loss of consciousness ≤ 30 minutes		
Yes	96	70.6
No	40	29.4
Amnesia ≤ 24 hours		
Yes	51	37.5
No	85	62.5
Other neurological abnormalities		
Yes (i.e., seizure, hemotypanum)	15	11.0
No	121	89.0
Area of head injury		
Temporal	69	50.7
Frontal	52	38.2

Table 2 (continued)

Characteristics	*n*	%
Occipital	10	7.4
Parietal	4	3.0
Undefined	1	0.7
Additional injuries		
No	95	69.9
Fracture (e.g., extremities, clavicle, costae, nasal)	41	30.1
Dislocation of the joints	(17)	(41.5)
Skin laceration	(9)	(21.9)
Blunt chest trauma	(8)	(19.5)
Eye trauma	(5)	(12.2)
	(2)	(4.9)
Medical disease history		
No	111	81.6
Yes	25	18.4
Hypertension	(9)	(36.0)
Gastritis	(6)	(24.0)
Diabetes Mellitus	(3)	(12.0)
Others (i.e., hypercholesterolemia, cataract, anemia, allergy)	(7)	(28.0)
Current medication of medical disease history		
No		
Yes (i.e., anti-hypertension drugs,	122	89.7
herbs for gastritis, and traditional		
medicine for Diabetes Mellitus)	14	10.3

Note. Mdn = median, *IQR* = interquartile range.

Post concussion symptom experience of persons with mild traumatic brain injury

Overall, the subjects had experienced on average seven symptoms (*M* = 6.71, *SD* = 3.22), with the occasional frequency (*M* = 2.32, *SD* = 0.55) and a slightly level of severity (*M* = 1.03, *SD* = 0.51) (Table 3).

Table 3

The Minimum, Maximum, Mean, Standard Deviation, Skewness, and Kurtosis of PCS Experience in Persons With mTBI (N = 136)

Items	Min	Max	*M (SD)*	Skewness/(*SE*)	Kurtosis/(*SE*)
PCS occurrence	1	14	6.71 (3.22)	-0.185 (.208)	- 0.713 (.413)
PCS frequency	1	4	2.32 (0.55)	-0.224 (.208)	- 0.220 (.413)
PCS severity	0	4	1.03 (0.51)	-0.196 (.208)	- 0.200 (.413)

Table 4 shows the PCS experience including the occurrence, frequency and severity reported by the subjects with mTBI. The top five symptom occurrences were physical and cognitive symptoms. The physical symptoms included dizziness (80.1%), headache (78.7%), fatigue (74.3%), followed by forgetfulness (63.2%), and taking longer to think (52.9%) as the cognitive symptoms. Considering the frequency and severity of each symptom, hearing disturbance was the first on the list before blurred vision, dizziness, respectively.

Table 4

Frequency and Percentage of the Subjects Classified by PCS Occurrence, Frequency and Severity (N = 136)*

Symptoms	Occurrence				Frequency									Severity level										
	Yes		No		Rarely		A little		Occasionally		Most time		*M (SD)*	Not severe		Slightly		Moderately		Severe		Very severe		*M (SD)/ Mdn (IQR)***
	1		0		1		2		3		4			0		1		2		3		4		
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	
Dizziness	**109**	80.1	27	19.9	16	14.7	24	22.0	60	55.0	9	8.3	**2.57** (0.84)	9	8.3	**65**	59.6	29	26.6	5	4.6	1	0.9	**1.30** (0.73)
Headaches	**107**	78.7	29	21.3	13	12.1	27	25.2	57	53.3	10	9.4	**2.60** (0.82)	8	7.5	**61**	57.0	31	29.0	4	3.7	3	2.8	1(1)**
Fatigue	**101**	74.3	35	25.7	6	5.9	44	43.6	41	40.6	10	9.9	**2.54** (0.75)	16	15.8	**55**	54.5	25	24.7	5	4.9	0	0	**1.19** (0.76)
Forgetfulness	**86**	63.2	50	36.8	11	12.8	38	44.2	31	36.0	6	7.0	2.37 (0.80)	13	15.1	53	61.6	17	19.8	3	3.5	0	0	1.12 (0.69)
Taking longer to think	**72**	52.9	64	47.1	9	12.5	33	45.8	26	36.1	4	5.6	2.35 (0.77)	13	18.0	42	58.3	13	18.1	4	5.6	0	0	1.11 (0.76)
Sleep disturbance	67	48.6	71	51.4	10	14.9	31	46.3	18	26.9	8	11.9	2.36	15	22.4	38	56.7	12	17.9	1	1.5	1	1.5	1(0)**

Table 4 (continued)

Symptoms	Occurrence				Frequency									Severity level										
	Yes		No		Rarely		A little		Occasionally		Most time		*M (SD)*	Not severe		Slightly		Moderately		Severe		Very severe		*M (SD)/ Mdn (IQR)***
	1		0		1		2		3		4			0		1		2		3		4		
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	
													(0.88)											
Poor concentration	61	44.9	75	55.1	8	13.1	27	44.3	23	37.7	3	4.9	2.34 (0.77)	12	19.7	35	57.4	12	19.6	2	3.3			1.07 0.73)
Restlessness/ anxiety	58	42.6	78	57.4	7	12.1	32	55.2	17	29.3	2	3.4	2.24 (0.71)	13	22.4	34	58.6	11	19.0	0	0	0	0	0.97 (0.67)
Depression	50	36.8	86	63.2	13	26.0	24	48.0	11	22.0	2	4.0	2.04 (0.81)	15	30.0	29	58.0	6	12.0	0	0	0	0	0.82 (0.63)
Irritability	48	35.3	88	64.7	8	16.7	20	41.7	15	31.2	5	10.4	2.35 (0.88)	12	25.0	24	50.0	10	20.8	2	4.2	0	0	1 (2)**
Blurred vision	44	32.4	92	67.6	3	6.8	8	18.2	20	45.5	13	29.5	**2.98** (0.87)	3	6.8	22	50.0	16	36.4	2	4.5	1	2.3	**1.45** (0.79)
Frustration	35	25.7	101	74.3	7	20.0	19	54.3	6	17.1	3	8.5	2.14 (0.84)	11	31.4	18	51.4	6	17.1	0	0	0	0	0.86 (0.69)
Noise sensitivity	27	19.6	111	80.4	8	29.6	15	55.6	3	11.1	1	3.7	1.89 (0.75)	11	40.7	13	48.2	2	7.4	1	3.7	0	0	0.74 (0.76)

Table 4 (continued)

Symptoms	Occurrence				Frequency									Severity level										
	Yes		No		Rarely		A little		Occasionally		Most time		*M (SD)*	Not severe		Slightly		Moderately		Severe		Very severe		*M (SD)/ Mdn (IQR)***
	1		0		1		2		3		4			0		1		2		3		4		
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	
Nausea and /or vomiting	16	11.8	120	88.2	7	43.8	6	37.5	1	6.2	2	12.5	1.88 (1.02)	7	43.7	7	43.7	2	12.6	0	0	0	0	0.69 (0.70)
Light sensitivity	12	8.8	124	91.2	2	16.6	8	66.7	1	8.3	1	8.3	2.08 (0.79)	4	33.3	7	58.4	1	8.3	0	0	0	0	1 (1)**
Hearing disturbance	11	8.1	125	91.9	0	0	0	0	5	45.5	6	54.5	**3.55** (0.52)	0	0	6	54.5	5	45.5	0	0	0	0	**1.45** (0.52)
Double vision	8	5.9	128	94.1	4	50.0	2	25.0	1	12.5	1	12.5	1.88 (1.12)	2	25.0	4	50.0	1	12.5	1	12.5	0	0	1.13 (0.99)

Note.* = One subject reported more than one answer

** = Median (*Mdn*) and interquartile range (*IQR*) for non-normally distributed continuous data

The subgroup analyses were conducted. The PCS occurrence, PCS frequency and PCS severity were tested to see whether there is a significant difference based on the duration post injury and the severity of injury. The duration of post injury was divided into two groups, within and more than 12 weeks post injury. The severity of injury was represented by score of GCS at ED admission which was divided into score 15 and score 13 to14.

The results show that there were no difference score of PCS occurrence and PCS frequency between the subjects who had injury within and more than 12 weeks, as well as for those who had GCS 15 and 13 to 14 at ED admission. The PCS severity score of the subjects who scored GCS 13-14 was higher than that of the subjects who scored GCS 15 at (*p* = .018), however, it was not different at the duration of post injury (Table 5 - 7).

Table 5

Subgroup Analysis of the PCS Occurrence on Duration of Post Injury and GCS

Subgroup	*M (SD)*	*df*	*t*	*p*
Period post injury (weeks)		134	-.707	.481 ^{ns}
2 - 12	6.50 (2.87)			
13 - 60	6.89 (3.53)			
GCS at ED admission		134	-1.735	.079 ^{ns}
15	6.44 (3.30)			
13 - 14	7.56 (2.78)			

Note. ns = non-significant

Table 6

Subgroup Analysis of the PCS Frequency on Duration of Post Injury and GCS

Subgroup	*M (SD)*	*df*	*t*	*p*
Period post injury (weeks)		134	.676	.500^{ns}
2 - 12	2.34 (0.54)			
13 - 60	2.28 (0.56)			
GCS at ED admission		134	-1.818	.071^{ns}
15	2.26 (0.55)			
13 - 14	2.47 (0.51)			

Note. ns = non-significant

Table 7

Subgroup Analysis of the PCS Severity on Duration of Post Injury and GCS

Subgroup	*M (SD)*	*df*	*t*	*p*
Period post injury (weeks)		134	1.264	.208^{ns}
2 – 12	1.08 (0.50)			
13 – 60	0.97 (0.51)			
GCS at ED admission		134	-2.403	.018*
15	0.97 (0.51)			
13 – 14	1.21 (0.46)			

Note. ns = non-significant, * = $p < .05$

Post concussion symptom management of persons with mild traumatic brain injury

Overall, the subjects in this study commonly used eight PCS management strategies, with occasionally frequency including (1) activities/thoughts, (2) complementary therapies, (3) nutrition, (4) exercise, (5) medications, (6) substance use, (7) health care services, and (8) being prepared. One management strategy was used to relieve more than one symptom. Considering each PCS management strategy, the top three commonly used were (1) activities/thoughts (e.g., get enough sleep, lay down, don't dwell on it, and talk with family or others), (2) complementary therapies (e.g., "*Dzikir*" [remembering and drawing oneself close to Allah] and praying), and (3) nutrition (e.g., eating well). Moreover, three PCS management strategies rarely used were (1) health care services, (2) medications, and (3) substance use (i.e., cigarettes).

Table 8

Frequency and Percentage of the Subjects Classified by the Common Use of the PCS Management Strategies for Common PCS(N = 136)*

Management Strategies for Common PCS	Total of Using the Strategies		Frequency					
			Rarely (1)		Occasionally (2)		Most times (3)	
	n	%	*n*	%	*n*	%	*n*	%
Dizziness (*n* = 109)								
Activities/thoughts								
Don't dwell on it	98	89.9	30	30.6	37	37.8	31	31.6
Talking with family	94	86.2	9	9.6	49	52.1	36	38.3
Being prepared								
Get up slowly	86	78.9	38	44.2	25	29.1	23	26.7
Move slowly	76	69.7	43	56.6	19	25.0	14	18.4
Health care services								
See doctor	51	46.8	30	58.8	20	39.2	1	2.0
Nutrition								
Vitamins/herbs	46	42.2	27	58.7	14	30.5	5	10.8
Medications								
Prescription medicine (e.g., Amitriptyline)	45	41.3	29	64.5	14	31.1	2	4.4
Substance use								
Cigarettes	30	27.5	15	50.0	11	36.7	4	13.3
Headache (*n* = 107)								
Complementary therapies								
Dzikir	106	99.1	23	21.7	64	60.4	19	17.9
Massage	89	83.2	33	37.1	47	52.8	9	10.1
Activities/thoughts								
Lay down	103	96.3	23	22.3	44	42.7	36	35.0
Close eyes	93	86.9	29	31.2	40	43.0	24	25.8
Medications								
Prescription pain medicine (e.g., Mefenamic Acid, Paracetamol, Acetaminophen)	65	60.7	42	64.6	17	26.2	6	9.2
Exercise								
Walking	48	44.3	23	47.9	21	43.8	4	8.3
Health care services								
See doctor	48	44.3	26	54.2	20	41.7	2	4.1

Table 8 (continued)

Management Strategies for Common PCS	Total of Using the Strategies		Frequency					
			Rarely (1)		Occasionally (2)		Most times (3)	
	n	%	*n*	%	*n*	%	*n*	%
Nutrition								
Vitamins	32	29.9	21	65.6	8	25.0	3	9.4
Substance use								
Cigarettes	30	28.0	14	46.7	10	33.3	6	20.0
Fatigue (*n* = 101)								
Activities/thoughts								
Get enough sleep	101	100.0	4	4.0	55	54.5	42	41.5
Take frequent breaks	99	98.0	18	18.2	52	52.5	29	29.3
Nutrition								
Eating well	99	98.0	9	9.1	63	63.6	27	27.3
Mineral	39	38.6	14	35.9	17	43.6	8	20.5
Complementary therapies								
Praying	98	97.0	17	17.4	58	59.1	23	23.5
Massage	88	87.1	27	30.7	54	61.3	7	8.0
Exercise								
Walking	50	49.5	26	52.0	20	40.0	4	8.0
Exercising	43	42.6	18	41.9	19	44.2	6	13.9
Substance use								
Cigarettes	30	29.7	17	56.6	8	26.7	5	16.7
Health care services								
See doctor	26	25.7	15	57.7	10	38.5	1	3.8
Medications								
Prescribe medications (e.g., Neurodex, Hemaviton)	14	13.9	7	50.0	7	50.0	0	0.0
Thinking/memory difficulties (i.e., forgetfulness, taking longer to think, and poor concentration) (*n* = 90)								
Activities/thoughts								
Get enough sleep	90	100.0	7	7.8	55	61.1	28	31.1
Talk with others	87	96.7	9	10.3	33	37.9	45	51.8
Nutrition								
Eating well	87	96.7	6	6.9	56	64.4	25	28.7
Herbal	35	38.9	15	42.9	14	40.0	6	17.1
Complementary therapies								
Praying	85	94.4	14	16.5	55	64.7	16	18.8
Massage	69	76.7	23	33.3	43	62.3	3	4.4

Table 8 (continued)

Management Strategies for Common PCS	Total of Using the Strategies		Frequency					
			Rarely (1)		Occasionally (2)		Most times (3)	
	n	%	*n*	%	*n*	%	*n*	%
Exercise								
Walking	43	47.8	23	53.5	18	41.9	2	4.6
Exercising	37	41.1	17	45.9	16	43.3	4	10.8
Substance use								
Cigarettes	28	31.1	16	57.2	7	25.1	5	17.7
Health care services								
See doctor	19	21.1	10	52.6	8	42.1	1	5.3
Medications								
Prescribe medications (e.g., Ritalin)	6	6.7	4	66.7	2	33.3	0	0.0
Over the counter medicine (e.g., Vitabrain, Cerebrovit)	4	4.4	2	50.0	1	25.0	1	25.0
Restlessness/Anxiety (*n* = 58)								
Activities/thoughts								
Watch television	58	100.0	7	12.1	28	48.3	23	39.6
Talking with family	55	94.8	2	3.6	15	27.3	38	69.1
Complementary therapies								
Dzikir	57	98.3	6	10.5	36	63.2	15	26.3
Praying	57	98.3	5	8.8	33	57.9	19	33.3
Exercise								
Walking	25	43.1	11	44.0	11	44.0	3	12.0
Exercising	21	36.2	5	23.8	10	47.6	6	28.6
Substance use								
Cigarettes	11	19.0	2	18.2	5	45.4	4	36.4
Health care services								
See doctor	5	8.6	3	60.0	2	40.0	0	0.0
Depression (*n* = 50)								
Complementary therapies								
Praying	50	100.0	5	10.0	30	60.0	15	30.0
Dzikir	50	100.0	6	12.0	30	60.0	14	28.0
Activities/thoughts								
Do things I enjoy	49	98.0	11	22.5	25	51.0	13	26.5
Talking with family	48	96.0	5	10.5	10	20.8	33	68.7
Exercise								
Walking	25	50.0	13	52.0	10	40.0	2	8.0

Table 8 (continued)

Management Strategies for Common PCS	Total of Using the Strategies		Frequency					
			Rarely (1)		Occasionally (2)		Most times (3)	
	n	%	*n*	%	*n*	%	*n*	%
Exercising	20	40.0	6	30.0	10	50.0	4	20.0
Substance use								
Cigarettes	17	34.0	5	29.4	6	35.3	6	35.3
Health care services								
See doctor	4	8.0	1	25.0	2	50.0	1	25.0

Note. * = One subject reported more than one answer

The subjects reported the various reasons for using the PCS management strategies, i.e., the strategies were the routine activities (77.2%), common practice (72.1%), easy to perform (67.6%), and effective for relief the symptoms (58.8%) (Table 9).

Table 9

Frequency and Percentage of the Subjects who Reported the Reasons for Performing the PCS Management Strategies (N = 136)*

Reasons	*n*	%
1. The strategies were routine activities, and increase the frequency to treat the symptoms (e.g., *Dzikir*, praying)	105	77.2
2. The strategies were common practice to relieve the symptoms (e.g., massage, being prepared activities)	98	72.1
3. The strategies were very easy to perform (e.g., lay down, close eye, take a nap)	92	67.6
4. The strategies were effective to relieve symptoms (e.g., meet health care provider, take medications)	80	58.8
5. The strategies could reduce the burden on the mind and obtain solutions from others experience (e.g., talk with family and other persons with brain injury)	72	52.9

Table 9 (continued)

Reasons	*n*	%
6. The strategies could help recovery process of head/body after injury (e.g., eating well, consume vitamin, mineral, herbal)	66	48.5
7. The strategies were first aid to relieve the symptoms (e.g., use relaxation techniques, take pain medicine)	42	30.9
8. The strategies were very cheap and fast to reduce the symptoms (e.g., buy medicine at a grocery/pharmacy)	15	11.0

*Note.** = One subject reported more than one answer

The majority of the subjects (72.1%) performed PCS management strategies by themselves. Nearly two-fifths of subjects (37.5%) asked health care provider (e.g., doctor, nurse, pharmacist, and midwife) in terms of using medication and seeking health care services. Only few subjects asked for help from their family (19.1%), and friends (8.8%) in performing PCS management strategies (Table 10).

Table 10

*Frequency and Percentage of the Subjects who Reported Performed PCS Management Strategies (N = 136)**

The persons performed PCS management strategies	*n*	%
1. Oneself	98	72.1
2. Health care provider (e.g., doctor, nurse, pharmacist, and midwife)	51	37.5
3. Family (e.g., parents, brother/sister, spouse, children)	26	19.1
4. Friends or others	12	8.8

*Note.** = One subject reported more than one answer

Most of the subjects (89.7%) performed the PCS management strategies when the symptoms occurred. Nearly half of the subjects (49.3%) performed the PCS management strategies when the symptoms worsened. A quarter of the subjects (25%) performed PCS management strategies when the symptoms disturbed their daily/job activities. One-tenth of subjects (11%) performed the PCS management strategies when the previous strategies were ineffective to relieve the symptoms (Table 11).

Table 11

Frequency and Percentage of the Subjects who Reported When PCS Management Strategies Were Performed (N = 136)*

When the PCS management strategies were used	*n*	%
1. The PCS happened	122	89.7
2. The PCS were worse	67	49.3
3. The PCS disturbed daily/job activities	34	25.0
4. The previous PCS management strategies were ineffective	15	11.0

*Note.** = One subject reported more than one answer

Regarding the places, most of the subjects (82.4%) performed the PCS management strategies at their homes. Moreover, 16.9 % of subjects did not specify the places as they performed the strategies wherever the symptoms occurred. A few subjects (7.4%) conduct their management at health care settings, such the health care service or massage parlors (Table 12).

Table 12

Frequency and Percentage of the Subjects who Reported the Places Where They Performed PCS Management Strategies (N = 136)*

The places	*n*	%
1. Home	112	82.4
2. No specific place (depends on the location when the symptoms occurred or getting worse, such as work place and relatives' house)	23	16.9
3. Health care place for a specific activities such as health care service settings and massage parlors	10	7.4

Note. * = One subject reported more than one answer

The subjects who conducted the PCS management strategies evaluated their effectiveness at a moderate to high level. Considering each PCS management strategy, complementary therapies (i.e., praying and *Dzikir*) and activities/thoughts (i.e., do things I enjoy and talk with family) were high effective to relieve affective symptoms. The activities/thoughts (i.e., make list, use calendar, get enough sleep, massage) and nutrition (i.e., eating well) were rated to be moderately effective to decrease physical and cognitive symptoms. For the substance use (i.e., cigarettes), although its effectiveness was rated at a moderate level, it was found to have the lowest score to relieve many symptoms (Table 13).

Table 13

Frequency and Percentage of the Subjects Classified by the Effective Level of the PCS Management Strategies

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Dizziness (*n* = 109)													
Health care services													
See doctor	51	0	0.0	6	11.7	31	60.8	14	27.5	0	0.0	2.16 (0.61)	Moderate
See other health care provider	18	0	0.0	2	11.1	12	66.7	4	22.2	0	0.0	2.11 (0.58)	Moderate
Nutrition													
Vitamins/herbs	46	0	0.0	9	19.5	24	52.2	12	26.1	1	2.2	2.11 (0.73)	Moderate
Low salt diet	39	0	0.0	11	28.2	26	66.7	2	5.1	0	0.0	1.77 (0.53)	Moderate
Medications													
Prescription medicine for dizziness	45	0	0.0	10	22.2	20	44.5	15	33.3	0	0.0	2.11 (0.73)	Moderate
Over the counter medications	39	0	0.0	9	23.1	18	46.1	12	30.8	0	0.0	2.08 (0.74)	Moderate
Being prepared													
Get up slowly	86	0	0.0	11	12.8	57	66.3	17	19.8	1	1.1	2.09 (0.60)	Moderate
Move slowly	76	0	0.0	11	14.5	52	68.4	12	15.8	1	1.3	2.04 (0.59)	Moderate
Activities/thoughts													
Don't dwell on it	98	0	0.0	20	20.4	51	52.1	26	26.5	1	1.0	2.08 (0.70)	Moderate
Talking with other persons with brain Injury	15	0	0.0	3	20.0	9	60.0	2	13.3	1	6.7	2.07 (0.79)	Moderate
Talking with family	94	0	0.0	16	17.0	62	66.0	14	14.9	2	2.1	2.00 (0.64)	Moderate
Substance use													
Cigarettes	30	6	20.0	7	23.3	11	36.7	6	20.0	0	0.0	1.57 (1.04)	Moderate

Table 13 (continued)

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Headache (*n* = 107)													
Complementary therapies													
Massage	89	0	0.0	4	4.5	52	58.4	33	37.1	0	0.0	2.33 (0.56)	Moderate
Reflexology therapy	18	0	0.0	2	11.1	11	61.1	5	27.8	0	0.0	2.17 (0.62)	Moderate
Dzikir	106	0	0.0	9	8.5	84	79.3	12	11.3	1	0.9	2.05 (0.48)	Moderate
Activities/thoughts													
Lay down	103	0	0.0	12	11.6	47	45.6	43	41.8	1	1.0	2.32 (0.69)	Moderate
Close eyes	93	0	0.0	17	18.3	57	61.3	19	20.4	0	0.0	2.02 (0.65)	Moderate
Medications													
Prescription pain medicine	65	0	0.0	10	15.4	25	38.4	30	46.2	0	0.0	2.31 (0.72)	Moderate
Over the counter medications	53	0	0.0	11	20.7	16	30.2	26	49.1	0	0.0	2.28 (0.79)	Moderate
Nutrition													
Herbal supplements	15	0	0.0	2	13.3	8	53.3	4	26.7	1	6.7	2.27 (0.79)	Moderate
Health care services													
See doctor	48	0	0.0	6	12.5	28	58.3	14	29.2	0	0.0	2.17 (0.63)	Moderate
See other health care provider	22	0	0.0	6	27.3	10	45.4	6	27.3	0	0.0	2.00 (0.75)	Moderate
Exercise													
Exercising	45	0	0.0	11	24.5	29	64.4	5	11.1	0	0.0	1.87 (0.58)	Moderate
Walking	48	0	0.0	14	29.2	30	62.5	4	8.3	0	0.0	1.79 (0.43)	Moderate
Substance use													
Cigarettes	30	6	20.0	6	20.0	12	40.0	5	16.7	1	3.3	1.63 (1.09)	Moderate

Table 13 (continued)

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Fatigue (*n* = 101)													
Complementary therapies													
Massage	88	0	0.0	2	2.3	41	46.6	44	50.0	1	1.1	2.50 (0.56)	Moderate
Praying	98	0	0.0	4	4.1	74	75.5	19	19.4	1	1.0	2 (0)*	
Activities/thoughts													
Get enough sleep	101	0	0.0	9	8.9	46	45.5	45	44.6	1	1.0	2.38 (0.66)	Moderate
Take frequent breaks	99	0	0.0	11	11.1	48	48.5	38	38.4	2	2.0	2.31 (0.69)	Moderate
Nutrition													
Eating well	99	0	0.0	4	4.1	60	60.6	33	33.3	2	2.0	2.33 (0.59)	Moderate
Mineral	39	0	0.0	3	7.7	25	64.1	11	28.2	0	0.0	2.21 (0.57)	Moderate
Vitamins	38	0	0.0	6	15.8	21	55.3	11	28.9	0	0.0	2.13 (0.66)	Moderate
Exercise													
Exercising	43	0	0.0	9	20.9	25	58.2	9	20.9	0	0.0	2.00 (0.65)	Moderate
Walking	50	0	0.0	18	36.0	23	46.0	9	18.0	0	0.0	1.82 (0.72)	Moderate
Health care services													
Seek information/education	7	0	0.0	1	14.3	5	71.4	1	14.3	0	0.0	2.00 (0.57)	Moderate
See doctor	26	0	0.0	8	30.8	13	50.0	5	19.2	0	0.0	1.88 (0.71)	Moderate
Medications													
Prescribe medications	14	0	0.0	6	42.9	6	42.5	2	14.3	0	0.0	1.71 (0.76)	Moderate
Substance use													
Cigarettes	30	6	20.0	8	26.7	13	43.3	3	10.0	0	0.0	1.43 (0.93)	Moderate

Table 13 (continued)

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Thinking/memory difficulties (*n* = 90)**													
Activities/thoughts													
Make list	71	0	0.0	7	9.9	17	23.9	43	60.6	4	5.6	2.62 (0.74)	Moderate
Use calendar	61	0	0.0	8	13.1	11	18.0	38	62.3	4	6.6	2.62 (0.79)	Moderate
Complementary therapies													
Praying	85	0	0.0	18	21.2	60	70.6	7	8.2	0	0.0	1.87 (0.53)	Moderate
Massage	69	0	0.0	17	24.6	48	69.6	4	5.8	0	0.0	1.81 (0.52)	Moderate
Nutrition													
Eating well	87	1	1.2	13	14.9	66	75.8	6	6.9	1	1.2	2 (0)*	
Vitamins	29	0	0.0	8	27.6	21	72.4	0	0.0	0	0.0	1.72 (0.45)	Moderate
Medications													
Over the counter medicine	4	0	0.0	1	25.0	3	75.0	0	0.0	0	0.0	1.75 (0.50)	Moderate
Substance use													
Cigarettes	28	1	3.6	11	39.3	10	35.7	6	21.4	0	0.0	1.75 (0.84)	Moderate
Health care services													
See doctor	19	0	0.0	7	36.8	11	57.9	1	5.3	0	0.0	1.68 (0.58)	Moderate
Seek information/education	10	0	0.0	1	10.0	8	80.0	1	10.0	0	0.0	2 (0)*	
Exercise													
Exercising	37	0	0.0	14	37.8	21	56.8	2	5.4	0	0.0	1.68 (0.58)	Moderate
Walking	43	0	0.0	19	44.2	23	53.5	1	2.3	0	0.0	1.58 (0.54)	Moderate

Table 13 (continued)

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Restlessness/Anxiety (*n* = 58)													
Complementary therapies													
Praying	57	0	0.0	1	1.7	16	28.1	36	63.2	4	7.0	2.75 (0.60)	High
Dzikir	57	0	0.0	1	1.7	18	31.6	34	59.7	4	7.0	2.72 (0.62)	High
Activities/thoughts													
Talking with family	55	0	0.0	2	3.6	16	29.1	32	58.2	5	9.1	2.73 (0.67)	High
Watch television	58	0	0.0	4	6.9	32	55.1	20	34.5	2	3.5	2.34 (0.66)	Moderate
Exercise													
Exercising	21	0	0.0	3	14.3	12	57.1	6	28.6	0	0.0	2.14 (0.65)	Moderate
Walking	25	0	0.0	6	24.0	16	64.0	3	12.0	0	0.0	1.88 (0.60)	Moderate
Substance use													
Cigarettes	11	0	0.0	3	27.3	5	45.4	2	18.2	1	9.1	2.09 (0.94)	Moderate
Health care services													
See doctor	5	0	0.0	1	20.0	3	60.0	1	20.0	0	0.0	2.00 (0.70)	Moderate
Depression (*n* = 50)													
Activities/thoughts													
Do things I enjoy	49	0	0.0	4	8.2	10	20.4	29	59.2	6	12.2	2.76 (0.77)	High
Talking with family	48	0	0.0	4	8.3	14	29.2	22	45.8	8	16.7	2.71 (0.84)	High
Complementary therapies													
Praying	50	0	0.0	2	4.0	15	30.0	29	58.0	4	8.0	2.70 (0.67)	High
Dzikir	50	0	0.0	3	6.0	16	32.0	27	54.0	4	8.0	2.64 (0.72)	High

Table 13 (continued)

PCS Management Strategies for Common PCS		Never (0)		Rarely (1)		Some times (2)		Often (3)		Always (4)		*M (SD)/ Mdn (IQR)**	Level
	n	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)		
Exercise													
Exercising	20	0	0.0	2	10.0	12	60.0	5	25.0	1	5.0	2.3 (0.71)	Moderate
Walking	25	0	0.0	8	32.0	14	56.0	2	8.0	1	4.0	1.8 (0.76)	Moderate
Health care services													
See doctor	4	0	0.0	1	25.0	3	75.0	0	0.0	0	0.0	1.8 (0.50)	Moderate
Substance use													
Cigarettes	17	5	29.4	2	11.7	7	41.2	3	17.7	0	0.0	1.5 (1.12)	Moderate

Note. * = Median (*Mdn*) and interquartile range (*IQR*) for non-normally distributed continuous data

** = The subject who had at least one symptoms of cognitive symptoms, i.e., forgetfulness, taking longer to think, and/or poor concentration

Quality of life in persons with mild traumatic brain injury

Overall, the level of QoL was at a moderate level (*M* = 3.73, *SD* = 0.76). The total mean score of personal and social life dimension had the highest score (*M* = 4.01, *SD* = 0.87) and physical condition dimension had the lowest score (*M* = 3.47, *SD* = 0.94) (Table 14).

Table 14

The Minimum, Maximum, Mean, Standard Deviation and the Level of QoL (N =136)

	Items	*Min*	*Max*	*M (SD)*	Level
1.	Personal and social life	1	5	4.01 (0.87)	Moderate
2.	Function in daily life	1	5	3.83 (0.98)	Moderate
3.	Current situation and future prospects	1	5	3.82 (0.89)	Moderate
4.	Emotions	1	5	3.70 (0.85)	Moderate
5.	Cognition	2	5	3.54 (0.88)	Moderate
6.	Physical condition	1	5	3.47 (0.94)	Moderate
	Total	1	5	3.73 (0.76)	Moderate

In addition, the subgroup analyses were conducted based on the duration of post injury and the severity of head injury. The result shows that there was no significant difference of QoL between the subjects injured within and more than 12 weeks. However, the QoL was significantly different between the subject scored GCS of 15 and GCS of 13 - 14 (Table 15). In addition, the relationship between PCS severity and QoL was examined, and the result showed that PCS severity had a significantly negative correlation with QoL (*r* = -.356, *p* = < .01) (Table 16).

Table 15

Subgroup Analysis of the QoL on Duration of Post Injury and GCS

Subgroup	*M (SD)*	*df*	*t*	*p*
Period post injury (weeks)		133	-.284	.777^{ns}
2 - 12	3.70 (0.76)			
13 - 60	3.74 (0.77)			
GCS		97	4.272	.000*
15	3.83 (0.80)			
13 - 14	3.36 (0.44)			

Note. ns = non-significant, * = p < .01

Table 16

Correlation Between PCS Severity and QoL (N = 136)

	Overall	Physical condition	Cognition	Emotions	Function in Daily life	Personal &social life	Current &future prospects
PCS severity	-.356**	-.312**	-.375**	-.337**	-.291**	-.184*	-.314**

Note. * = p < .05, ** = p < .01

Discussion

Demographic and health-related data

The 136 subjects with mTBI in this study were from the young adult in group range 18-30 years old (60.3%). Global data supports that the most common persons with mTBI were young adults under the age 45 years (Faul et al., 2010; VA/DoD, 2009). This result was similar to Firmawati's study (2013) which showed most of persons with mTBI in Indonesia were young adults.

Regarding gender, the present study showed comparable numbers of females (50.7%) and males (49.3%). As nowadays many Indonesians women work outside the home and similarly to men gain paid work (Ingham, n.d.), consequently, the women had a risk of traffic accidents similar to men. Regarding occupational status, the subjects in this study were workers (55.9%) and students (26.5%). The subjects mostly conducted their activities outside the home and they regularly used transportation and the highway. Unsurprisingly, the major cause of mTBI in this study was traffic accident, most commonly from motorcycle accident (88.3%). The proportion of motorcycle use is the highest among all vehicles in developing countries, including Indonesia (WHO, 2011). Similar to most of developing countries, the working people living in urban areas (e.g., Banda Aceh city in Aceh province, Indonesia) and prefer to use motorcycles because it is inexpensive, convenient in traffic congestion, and easy to park on narrow streets (Krishman & Smith, 1996). The finding of this study was similar to Firmawati (2013) and Kliangda (2009) who studied in Indonesia and Thailand, respectively. They found that their subjects commonly had injury from motorcycle accident.

The areas of head injury were commonly found at temporal area (50.7%) and frontal area (38.2%). This finding was supported by previous studies which found that the impact of motor vehicle collision and falls mostly occurred at the side/temporal area and the frontal area (Datta, Pillai, Rao, Kavoor, & Chandramouli, 2009; Depreitere et al., 2004). The possible causes may be the subjects might not wear motorcycle-helmet or wear it ineffectively while riding (Conrad, Bradshaw, Lamsudin, Kasniyah, & Costello, 1996) and the shape of helmet may not cover the head in lower parts of the side and front area (Depreitere et al., 2004). In cases of helmet damage, part of the helmet may immediately face the temporal area (McIntosh et al. as cited in Depreitere et al., 2004). Moreover, approximately one-third of the subjects reported other organ injuries (30%), e.g., skin laceration, dislocation or fractured extremities. This finding was supported by a review about the patterns of motorcycle injuries that showed extremities injury most commonly occurs (Lin & Kraus, 2009), and skin laceration common occurs due to the crash and exposure to the road and environment.

Regarding the subjects' initial condition after injury, most of subjects (76.5%) had GCS at 15 and loss of consciousness less than or equal to 30 minutes, which were commonly found in mTBI. This was supported by Alexander (1995) who stated that the score of 15 almost certainly represented the true mTBI. This was consistent with previous studies which found that almost all subjects scored 15 for GCS. Bergman (2011), Dischinger et al. (2009), Snell et al. (2011), and Stulemeijer et al. (2010) similarly had a significant number of the subjects who scored a GCS of 15 with as many as 94%, 81%, 83.2%, and 77%, respectively.

Post concussion symptom experience of persons with mild traumatic brain injury

The subjects in this study experienced an average number of seven symptoms (*M* = 6.71, *SD* = 3.22, *Range* = 1 - 14), which were reported within 2 to 60 weeks. Related to the average number of PCS, the present study finding was quite similar with a previous study in which Wojcik (2010) found that the average number of symptoms was 7.5 (*SD* = 3.2).

The PCS experience of the subjects in this study is possibly influenced by several factors related to the SMM of Dodd et al. (2001). These factors were health and illness (e.g., the neuropathology of mTBI, the area of head injury, concomitant symptoms, and head injury severity [GCS]), person characteristic (working age) and environment (lack of PCS information).

The neuropathology of mTBI could be explained the occurrence of the PCS. Neuro-damage is as the result of swift acceleration and deceleration due to the external force to the head, which damages the structure and the metabolism of the brain cell (Alexander, 1995; Barkhoudarian, Hovda, & Giza, 2011). The structure neuropathology in mTBI or diffuse axonal injury occurs from the fragile structures of axons and small vessels leading to swelling and lysis of axon and producing hemorrhages (Len & Neary, 2011; Werner & Englhard, 2007). Moreover, the neuro-metabolic cascade includes alteration of neurotransmitter hormone function and electrolyte fluctuations at the cellular level. Consequently, the cerebral autoregulation is interrupted (Prigatano & Gale, 2011) and the brain's metabolic functions are altered (McCrea, 2008). These conditions lead the insufficiency of oxygen and nutrients of the muscle on the head. Thus, the subjects with mTBI perceived the uncomfortable feeling alike headache (Quinn et al., 2002).

The area of head injury contributed to some PCS occurrence. For example, temporal area injury may cause damage to peripheral vestibular function (DCoE, 2010), the memory, and processing input and storing of the data (Gould & Dyer, 2011). Evidence in this study also showed that the subjects commonly reported dizziness, forgetfulness, and taking longer to think. In addition, injury at the temporal area is possibly related to skull trauma leading to the subjects having hemotympanum at ED admission and developing hearing disturbance later (Munjal, Panda, & Pathak, 2010). Injury at the occipital area may damage the optic tract and contribute to blurred vision (Greenwald, Kapoor, & Singh, 2012).

Symptom-associated factors also possibly affected development of other PCS occurrence in the subjects of this study. This was supported by Lannsjo et al. (2009) who found that all symptoms had a strong positive interrelation each other. Consistently, a previous study has reported that headache and visual system deficiencies are associated with dizziness (DCoE, 2010). Sleep complaints at 10 days are associated with headache (Chaput, Giguère, Chauny, Denis, & Lavigne, 2009). Headache and sleep disturbance contribute to fatigue, as well as reporting more PCS and higher level of severity greatly affect further development of fatigue (DCoE, 2010; Ponsford et al., 2011). The symptoms related to vestibular and cognitive problems, such as dizziness, headache, and memory loss also put persons with mTBI at high risk of blurred vision (Greenwald et al., 2012).

With regard to head injury severity, difference in the PCS severity was detected between the subjects who scored a GCS of 15 and those who scored a GCS of 13 and 14 at ED admission (p = .018). The subjects who scored a GCS of 13 - 14 at ED admission could perceive more severe symptoms than those of GCS 15 because they were considered at risk of a high frequency of brain pathology (Kristman et al., 2014).

Besides the health and illness factor, personal characteristic factor and environment factors may develop persistent and quite high level of severity of some PCS that were seen in this study (i.e., hearing disturbance, blurred vision, and dizziness). Since the majority of subjects were at a working age, who attempted or were expected to return to work post mTBI, this personal characteristic may contribute to the severity of PCS because the tasks in the workplace or school may affect the function of the brain or sensorimotor vision and auditory before complete recovery post injury (VA/DoD, 2009; Greenwald et al., 2012). This situation could trigger the PCS occurrence, symptoms worsening (Gioia et al., 2008), persistence of symptoms (VA/DoD, 2009), and damage the brain's visual and/or auditory functions (e.g., hearing disturbance and blurred vision) (Greenwald et al., 2012; VA/DoD, 2009). In addition, when the subjects with mTBI return to work or study, most of them may have limited time to consult their symptoms with health care professionals (Table 8). And, if no further health care professionals' information for PCS experience and their management was provided to the subjects with mTBI during living in community, they may possibly struggle to manage PCS by themselves and lack PCS relief effectiveness. Consequently, the subjects in this study had short and long term PCS experiences after mTBI, these results were similar to previous studies. They showed that the persons with mTBI faced with PCS up to a year post injury (Dean et al., 2012; Fourtassi et al., 2011; Greenwald et al., 2012; King & Kirwilliam, 2011; Zumstein et al., 2011).

Post concussion symptoms management of persons with mild traumatic brain injury

Based on the SMM of Dodd et al. (2001) and the Symptom Self-management Scale adapted for TBI (SSMS-TBI), the PCS management strategies the subjects used to manage/alleviate their symptoms were discussed including what and how the strategies were commonly conducted, the reason for conducting the strategies, when and where they were conducted, who helped while they were conducted and how much and how the effective the strategies. Also, three domains including person, health and illness, and environment were used to explain the PCS management strategies.

Overall, the subjects used eight PCS management strategies, with occasional frequency. Each subject used several strategies to treat one symptom. One strategy was used to manage more than one symptom. Consistently, Dodd et al., (2001) stated that one strategy may reduce more than one symptom. In this study, the top three strategies subjects most commonly used to manage their PCS including (1) activities/thoughts; (2) complementary therapies; and (3) nutrition, are discussed as follows.

The activities/thoughts strategies. These common activities/thoughts strategies were used by subjects, such as taking a rest by laying down, getting enough sleep, closing eyes, do not dwell on it, and talking with family. The literature review suggests that taking a rest by sleeping well and ensuring the neutral position of neck and spine for at least two weeks post injury will help the brain recover from the injury (CDC, 2003; DCoE, 2010; de Kruijk et al., 2002) and avoid worsening of the symptoms (Alexander, 1995). Enough rest and limiting physical activities are important to prevent PCS occurrence, worsening of symptoms and/or persistent PCS (Gioia et al., 2008). The thought activities related to “talk with family or others” were also performed reflecting the good relationship between the subjects and their family/friends. Consequently, they were able to express feeling about the symptoms and could receive information based on other experiences about the ways to manage and reduce their negative feelings in PCS (Oddy & Herbert, 2008).

The complimentary therapies. The complimentary therapies were commonly used including *Dzikir* and praying. In this study, *Dzikir* and praying were unique strategies performed by most subjects because they were the routine activities of Muslim people. *Dzikir* is the activity that looks like meditation, the Muslim people's remembrance of God, mostly silently, and involving the recitation of the name of God. In Al-Qur'an, Q. S. Al-Ahzab: 41 stated that "O you who have believed, remember Allah with much remembrance (*Dzikir*)". Remembering Allah in *Dzikir* brings benefits, as mentioned in Al-Qur'an Q. S. Ar-Ra'd: 28 "Those who have believed and whose hearts are assured by the remembrance (*Dzikir*) of Allah. Unquestionably, by the remembrance of Allah, hearts find satisfaction (assured/calm)". So that, the mindfulness, sobriety, positive thinking and believing of the grace of God are the aim of using this strategy. In this study, *Dzikir* was used by almost all subjects who reported depression (100%), headache (99.1%), and restlessness/anxiety (98.3%).

Praying was most commonly used to relieve subjects' depression (100%), restlessness/anxiety (98.3%), fatigue (97.0%), and thinking/memory difficulties (94.4%). Praying is a personal spiritual behavior which is the center of an intimate relationship with God. This finding is supported by the qualitative research of Casterline (2006), which found that praying gives comfort and peacefulness because the intimate relationship with God promoted feelings of healing and well-being.

The nutrition strategies. Since eating well was necessary to provide enough calories, certain nutrients and chemicals for brain functioning and recovering injured cells (Keatley & Whittemore, 2010), they should maintain regular meal and adequate hydration (VA/DoD, 2009). Moreover, the Aceh province is located in a coastal marine area and has wide area of fields and plantations, so the environment provides cheap protein resources, carbohydrates, vitamins and minerals. Therefore, it is convenient and easy for the many subjects in this study and their family to find the nutritious foods in order to increase energy and reduce symptoms such as fatigue (98.0%) and thinking and memory difficulties (96.7%).

Regarding the reasons (why) and places (where) of PCS management strategies used in this study, most of subjects reported because these strategies, such as *Dzikir* and praying were routine activities and were done based on Muslim people's beliefs and religion. Religious and spiritual therapies have been proven to have a positive outcome on physical and mental well-being (Hook et al., 2010). Some subjects also talked and shared their feelings with family or others about their symptoms to reduce their symptoms. This reflects the social norms of helping each other that is well established in Indonesia (Higgins & Higgins as cited in Goodwin & Giles, 2003). In addition, the low-cost and quickness of performing some PCS strategies (e.g., buy medicine drugs at grocery/pharmacy shop) possibly were another reason for some subjects in this study who had low-middle family incomes and/or lack of time to visit health care professional due to working /school hours. Moreover, the subjects' home was the place that most of subjects commonly performed PCS management strategies because it was convenient for them to do many methods, such as lay down, get enough sleep, or talk with family.

Considering the time (when) to perform PCS management strategies, it is apparent that most subjects used their management strategies when the PCS occurred (89.7%), they felt worse (49.3%), or their activities were disturbed (25.0%)

rather to prevent PCS. Moreover, the majority of subjects managed PCS by themselves whereas some met health care professionals. This may be explained by the fact that all subjects had mild level of TBI, and most of them perceived their PCS, with occasional frequency and a slightly severe level. In addition, they were adults who might have more experience of performing self-management than child/older people who have limitations (Bergman, 2011; Dodd et al., 2001). Also, if no/lack of further PCS experience and PCS management information or follow-up was performed by heath care providers, the subjects with mTBI may lack awareness of how to prevent and manage in their PCS effectively (de Kruijk et al., 2002).

In addition, the findings in this study showed that the effectiveness of the PCS management strategies was at a moderate to high level. The complementary therapies (i.e., praying and *Dzikir*) and the activities/thoughts (i.e., do things I enjoy and talk with family) were rated high for reducing affective symptoms (i.e., depression, restlessness/anxiety). This may be because these strategies made the subjects feel gratitude and forgiveness to God, be relaxed and calm, and distracted from the stress conditions. This finding was similar to a previous study of Kristofersson (2010), which showed that most persons with TBI perceived benefits of mindful meditation practice to treat depression and anxiety. Casterline (2006) found that a relationship with God through prayer would provide more comfortable and peaceful feeling and decrease stress and depression. In addition, social support from family was helpful to patients to minimize adverse symptoms and make them stronger to deal with problems after mTBI (Bay et al., 2012).

Furthermore, the effectiveness of the activities/thoughts (i.e., making list, using calendar, getting enough sleep, massage) and the nutrition (i.e., eating well) were rated at the moderate level. This may be because these strategies were non-pharmacological methods that most subjects commonly used to deal with their physical and cognitive symptoms (i.e., dizziness, headache, fatigue, and thinking/memory difficulties). In addition, most of them used PCS management when their symptoms occurred or their health got worse. In fact, these PCS were mainly caused by the neuropathology related to mTBI and concomitant symptoms. Therefore, the combinations with pharmacological treatments for controlling/ reducing the physical and cognitive symptoms were important. However, only one quarter of the subjects in this study used the health care service (Table 8). Consequently, it might be difficult to fully reduce their PCS. This may be another reason that led them assess the effectiveness of PCS management at the moderate level.

Obviously, the results in this study found that approximately one-quarter of subjects who smoked before injury increasingly used the cigarettes after mTBI to cope with their PCS (Table 8). The effectiveness of using cigarettes to reduce PCS was rated at the lowest score, meaning that cigarette use was the least helpful method employed to relieve the PCS. This is because continued smoking after injury will increase cerebral oxidative stress, which may inhibit neurological recovery and adversely affect neuro-cognitive recovery in persons with mTBI (Durazzo et al., 2013). This issue was critical for health care professionals to manage this subject group.

Quality of life in persons with mild traumatic brain injury

In this study, the subjects with mTBI reported overall and each dimension of QoL at a moderate level. This meant that they were moderately satisfied with their QoL including personal and social life, function in daily life, current situation and future prospect, emotions, cognition and physical condition. Similarly, several studies found that the persons with mTBI rated their QoL at a moderate level (Beseoglu et al., 2012; Fourtassi et al., 2011; Kliangda, 2009; Sukraeny, 2013; Zumstein et al., 2011). These findings could possibly explained by the symptom experience, symptom management strategies and three factors that were person, health and illness, and environment in the SMM of Dodd et al. (2001).

Considering the score of each dimension of QoL, the personal and social life dimension had highest score, followed by the function in daily life while the dimensions with the lowest score were in the physical condition and the cognition, respectively. Personal and social life and function in daily life may have scored the highest for several reasons. Firstly, the subjects in this study had a mild level of brain injury that was not life-threatening, less disability, and most of them were young adults who might have a chance for good recovery after injury. Therefore, they could come back to work/study. From a young adult's perspective, a return to work post injury may be shown as a valued long term indicator of QoL (Rufflo, Friedland, Dawson, Colantonio, & Lindsay, 1999). Employment is important, not only for earning a livelihood, but for determining access to health care, social support system, and self-esteem. In addition, a return to work is associated with improved health, well-being, social integration and QoL. Similarly, the study of O' Neill et al. (1998) showed that employment had relationship with perceived QoL, social integration, and home and leisure activities. Tsaousides et al. (2009) also found that employment correlated positively with QoL for persons with TBI. Secondly, receiving support from family and others may help the subjects in this study cope and manage their PCS because the importance of family relationships and family support remain high in Indonesia, which is shown as the majority live in an extended family (www.countryreports.org). Relatives/neighbors often visits each other to give support physically and emotionally, especially, when one of the family members or someone is sick or injured (Higgins & Higgins as cited in Goodwin & Giles, 2003). Therefore good family support contributes to good level of QoL that with similar to Fithria's study (2009). Thirdly, the subject's faith and meaning of life which are possibly supported by the Islamic teaching could make the subjects who perform praying and *Dzikir* had emotionally settle when they face bad conditions or long-term problems such as PCS experience. Consistent with a previous study, most patients with mTBI (85%) had moderate satisfaction after using religious therapy (Gau, Yang, Huang, & Lou, 2012).

However, as the subjects with mTBI had many PCS occurrence (*M* = 6.71) and the top five PCS occurrences were physical and cognitive symptoms (e.g., dizziness, headache, fatigue, forgetfulness, and taking longer to think, respectively), it is no wonder that the satisfaction with physical condition and the cognition among subjects in this study was lower than personal and social life and the function in daily life. The high occurrence of the physical and cognitive symptom may be because most of subjects managed these symptoms by themselves rather than received medical treatments and/or sought the information from the health care professionals (Table 8). So, the frequency and the severity levels of these symptoms were high, such as hearing disturbance, blurred vision, and headache, which could interfere with the subjects' daily activities including domestic and occupational works and QoL (Emanuelson et al., 2003). These findings were supported by Beseouglu et al.'s study (2012) which found that the patients who did not fully recover from their symptoms for a long period, predominantly physical symptoms and cognitive impairment would have reduced life satisfaction and QoL. Similarly, Lannsjo et al. (2009) found that specific symptoms induced low level of QoL, predominantly of fatigue, and cognitive impairment.

In addition, subgroup analyses showed more detailed information regarding the QoL level. There was no significant difference of in QoL level among duration of post injury (t = -.284, p = .777), while the subjects who scored GCS of 13-14 had lower QoL than those who scored CGS of 15 (p = .000). This may be because the subjects with GCS of 13-14 were considered at risk of intracranial lesion and had higher frequency of brain pathology than those with GCS of 15 (Kristman et al., 2014). These results were supported by a previous study which found that less severity of injury was associated with greater life satisfaction and better self-report of their health status (Kalpinski et al., 2013).Another subgroup analyzed also showed that PCS severity had a significantly negative relationship with QoL (r = .356, p < .01) reflecting that the subjects who have higher severe level of PCS would report a lower QoL. This finding was supported by the SMM (Dodd et al., 2001), which suggests that there is relationship between symptom experience (e.g., PCS severity) and outcomes (e.g., QoL). When the subjects in this study had a relatively high functional level pre-injury, there was limitation in performing physical activities resulting from severe physical problems of PCS post mTBI (e.g., hearing disturbance, blurred vision, and dizziness). With this regard, they reported a low QoL consistent with another study. King and Kirwilliam (2011) found that the PCS severity reduced a person's capacity to work and negatively correlated with QoL of patients after mTBI.

Based on the SMM of Dodd et al. (2001), three dimensions composed of PCS experience, PCS management and QoL of Indonesian persons with mTBI could be explained as dynamic processes. These three dimensions have an interrelationship with each other. The PCS experience occurred after initial mTBI and until years post injury. PCS frequency and their severity level were expected to change all the time. The PCS experience might be worse or better, depending on the PCS management strategies (what, how, who, when, where, how often, and how the effectiveness of the strategies). The persons with mTBI would use or alter a variety of PCS management strategies to reduce or control their PCS in order to maintain their QoL over the time. Moreover, those dimensions were influenced by three factors including the person domain (e.g., personal characteristics), the health and illness domain (e.g., head injury severity, area of head injury, concomitant symptoms, and health risk behaviors), and the environment domain (e.g., health care service, social support, health belief, religion and culture).

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusions of the study based on research findings. The strengths and limitations of this study are addressed. Furthermore, implications and recommendations for nursing practice, nursing education, and future research are offered.

Conclusions

This cross sectional descriptive study was designed to examine the PCS experience, PCS management and QoL of the persons with mTBI in Indonesia. The study included a total of 136 subjects who have experienced of mTBI for at least two weeks. The subjects were admitted in two government hospitals in Aceh province, Indonesia. The data collection was performed from December 2012 to March 2013. The subjects were interviewed based on questionnaires, which consisted of Demographic Data and Health-Related Data, the Rivermead Post Concussion Symptoms Questionnaire (RPQ), the Symptom Self Management Scale adapted for TBI (SSMS-TBI), and the Quality of Life after Brain Injury Overall Scale (QOLIBRI-OS). The questionnaires were validated by three experts and were translated to Indonesian language. Then, a reliability test was conducted. The intraclass correlation coefficients for Indonesian version of the RPQ yielded a value of .92 and of the SSMS-TBI yielded values between .77 and .90. Cronbach's alpha coefficient of reliability for QOLIBRI-OS yielded value of .91. Descriptive statistical analysis was applied, including frequency, percentage, mean, standard deviation, median and interquartile range.

The majority of subjects were young adults (*Mdn* = 27 years, *IQR* = 18, *range* = 18 - 65). The number of females was comparable to those of males. Most of the subjects were workers and students with a college level of education. The subjects sustained a mTBI in the period 2 to 60 weeks post injury (*Mdn* = 13 weeks, *IQR* = 24). The major cause of TBI was motorcycle accident with a GCS score of 15 (76.5%), the location of blunt at temporal site (50.7%), and without additional injury (69.9%).

The subjects experienced 17 symptoms with an average of seven symptoms (*M* = 6.71, *SD* = 3.22), occasionally frequency (*M* = 2.32, *SD* = 0.55), and a slightly severe level (*M* = 1.03, *SD* = 0.51). The top five common symptoms found were dizziness, headache, fatigue, forgetfulness, and taking longer to think, respectively. Concerning the high frequency and severity level of each symptom, blurred vision (*M* = 1.45, *SD* = 0.79), the hearing disturbance (*M* = 1.45, *SD* = 0.52), and dizziness (*M* = 1.30, *SD* = 0.73) were ranked first, second and the third, respectively.

The subjects performed several strategies with occasional frequency to reduce one or more symptoms. The three most common PCS management strategies used were (1) activities/thoughts, (2) complementary therapies, and (3) nutrition. The reasons for using those strategies were routine activities, easy, cheap, and fast. Most subjects managed the PCS by themselves at home or other places when their symptoms occurred or got worse. Overall, the subjects evaluated their PCS management at a moderate to high level of effectiveness in relieving these symptoms.

The subjects evaluated the overall QoL and each dimension of individually at a moderate level (*M* = 3.73, *SD* = 0.76). For each dimension, the personal and social life had the highest mean score (*M* = 4.01, *SD* = 0.87), while the physical condition dimension had the lowest score (*M* = 3.47, *SD* = 0.94).

Additional analyses showed that the subjects who scored GCS of 13 - 14 had higher PCS severity and lower QoL level than the subjects who scored GCS of 15 had (t = -2.403, p = .018, and t = 4.272, p = 000, respectively). The PCS severity was negatively correlated to the QoL level (r = -.356, p < .01).

Strengths and Limitations

The strengths of this study include:

1. This study provided baseline current situation data of the PCS experience, PCS management and QoL of Indonesian persons with mTBI from the referral and general hospitals in Aceh Province for developing future research.

2. This study provided knowledge for nurses and health care providers to understand of the PCS experience, PCS management, and QoL of Indonesian persons with mTBI to plan the appropriate PCS management strategies consistent with the social and cultural context.

The limitations of this study include:

1. The weakness of statistical analysis, e.g., (1) the sample size was decreased due to the incomplete contact information in the subjects' medical record; and (2) the large range of the post mTBI duration (2 to 60 weeks) may contain biased data since the subjects might perceive PCS differently regarding the injury recovery process.

2. Many PCS management questions were asked related to each PCS occurrence. Consequently, many subjects spent time ranging from 15 - 90 minutes

that made them feel bored and tired and adversely affected the response data; in particular, subjects who had difficulty thinking or remembering details.

3. Lack of the data about the area of head injury which was exposed by the external trauma. Since this data was collected from the subjects' report, it is considered data lacking in accuracy. The actual data should be obtained from the CT brain scan result.

Implications and Recommendations

This study provides findings about the PCS experience, PCS management and QoL in Indonesian persons with mTBI. As a consequence of data findings, subsequent recommendations were proposed.

Nursing practice

1. Nurses and health care professionals should be aware of the common PCS that occur in persons post mTBI, such as dizziness, headache, fatigue, difficulty of thinking/memory. The regular assessment of these symptoms should be carried out and be given a high level of concern towards its management.

2. Nurses and health care professionals should be proactive in providing a PCS management program to the persons with mTBI. The program should include information concerning PCS experience, medications, education, provision of coping strategies, ongoing advice and support, and regular follow-up visits (e.g., telephone call). The education materials, such as pamphlet/booklet on PCS management should also be given to the patients so they are easily able to review the aspects of PCS management while at home.

3. The findings in this study showed that most subjects with mTBI evaluated the effectiveness of the complementary therapies (i.e., praying and *Dzikir*)

and the activities/thoughts (i.e., do things I enjoy and talk with family) for reducing the affective symptoms (i.e., depression and restless/anxiety) at a high level. Therefore, the nurses should suggest these strategies to other patients with mTBI as alternative ways because they are routine activities that are fit with their cultural context.

4. The nurses and health care professionals should provide adequate consultation to the persons with mTBI who are at risk of high PCS severity and low QoL, especially, the persons with mTBI who score a GCS of 13-14, hemotypanum, or eye trauma at ED admission.

5. In this study, “the cigarettes use” was one of the PCS management strategies that some subjects (smokers) post mTBI reported and rated its effectiveness at the lowest score. This is a critical issue that the nurses and health care professionals should be aware of the patients’ health risk behavior leading to the increased of PCS experience Therefore, the development of behavioral and pharmacological interventions to facilitate sustained smoking cessation and maximum recovery after mTBI is necessary for these subjects.

Nursing research

1. Further research should be investigated about the predictive factors of QoL in persons with mTBI, such as physical functioning, cognitive dysfunction, return to work, religious coping, and family support.
2. Regarding the numerous question items included in the PCS management questionnaire related to PCS occurrence, modifying the tools to make the questionnaire more concise is recommended.
3. A replication study with the larger sample size extended to other settings should be conducted.

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APPENDICES

APPENDIX A

Informed Consent Form

Dear Subject,

My name is Fikriyanti and I am a master student in the Faculty of Nursing, Prince of Songkla University, Thailand. I am conducting a research study entitled “The Post Concussion Symptom Experience, Post Concussion Symptom Management, and Quality of Life in Persons With Mild Traumatic Brain Injury in Indonesia”. The objectives of this study are to identify PCS occurrence, frequency and severity in persons with mTBI, to explore the PCS management in persons with mTBI, and to examine the level of QoL in persons with mTBI in Indonesia.

This study has been approved by the Research Ethic Committee of Faculty of Nursing, Prince of Songkla University, Thailand. I will ask you to participate in this research project. If you decide to participate in this study voluntary, you will be asked about your personal information in demography questionnaire and health-related data about your injury. Then you will be administered the questionnaire to identify your PCS occurrence, frequency and severity after injury and explore your symptom management. Finally, you will be asked about your satisfaction about QoL after injury. The whole process may take your time about 30 minutes.

Risk and discomforts:

There is no evidence shown risk related to finish the questionnaires. However, there is a possibility that some questions will be a burden to you, please let me know. If you decide to stop involved in the study for any reasons, you may stop without penalty. And you can withdraw any contribution as well. I also would like to inform you that I will put your information in my thesis and present the result of this study at conference and perhaps it will publish in an academic journal.

Benefits:

Information derived from this study will explore about symptoms which happen post injury, especially in people with mild traumatic brain injury. The result may benefit to guide nurses to develop discharge planning program for persons with mild traumatic brain injury to manage their post concussion symptom effectively.

Confidentiality:

All information and your responses in this study will remain confidential. Only the researcher and the advisors are eligible accessing the data. To preserve confidentiality and anonymity, I will use codes. Neither your name nor any identifying information you will not be used in the reports of the study.

Participation and withdrawal:

Your participation in this study is voluntary. Signing the informed consent or agreeing verbally to participate indicates that you understand what is involved and you agree to participate in this study. You have the right to withdraw from participation anytime without any problems prior to completion of data collection.

Finally, if you have questions, you can contact me by mobile phone 085260012830 or by email at: fikri_1920@yahoo.co.id. Please sign your name on the concern form if you agree to participate. Thank you for expressing interest in this study.

____________________	____________________	____________________
(Name of subject)	(Signature of subject)	Date

Fikriyanti	____________________	____________________
(Name of researcher)	(Signature of researcher)	Date

APPENDIX B

Demographic and Health-Related Data Form

Subject No:__________________ Date of collecting Data : _________________

Part 1 Demographic data

Please answer the following questions and give the check list (√) on the parenthesis and fill in the blank area.

1. The time of mild traumatic brain injury ______(month)______(date), ________(year)
2. Age ________ years

3. Gender:	1 ( ) Male	2 ( ) Female
4. Religion:	1 ( ) Islam	2 ( ) other, identify _______
5. Marital status:	1 ( ) Single	2 ( ) Married
	3 ( ) Widowed	4 ( ) Divorced
6. Educational level:	1 ( ) No education	2 ( )Primary school
	3 ( ) High School	4 ( ) Diploma level
	5 ( ) Bachelor level	6 ( )Master level
7. Occupation:	1 ( ) Employee	2 ( ) Non-employee
	3 ( ) Student	4 ( ) personal business
	5 ( ) Agricultural worker	6 ( ) Housewife
	7 ( ) Merchant	8 ( )others identify_____
8. Family Income: (Rupiah/month)	1 ( ) ≤ Rp. 1,350,000	2 ( )Rp. 1,350,000 - 2,500,000
	3 ( ) > Rp. 2,500,000	
9. Medical payment	1 ( ) Government insurance	2 ( ) My money
	3 ( ) Private insurance	4 ( ) other, identify ___
10. Living arrangements:	1 ( ) Alone	2 ( ) With family
	3 ( ) With friends	

Part 2: Health-related data

11. Cause of mTBI		
	1 ( ) Assault	2 ( ) Motor vehicle collision
	3 ( ) Sport injury	4 ( ) Fall
	6 ( ) others, ___________	
12. Type of head injury		
	1 ( ) Soft tissue/laceration	2 ( ) Fracture
	3 ( ) Swelling/lump	4 ( ) others, ________

13. Injury variables: Sign and symptoms at ED admission

Score on the Glasgow Coma Score (GCS)

1 ( ) 15 2 ( ) 14 3 ( ) 13

Confusion/disorientation

1 ( ) yes, describe, ______________

2 ( ) no

Loss of consciousness for 30 minutes or less

1 ( ) yes, describe ______________

2 ( ) no

Amnesia for less than 24 hours

1 ( ) yes, describe ______________

2 ( ) no

Others neurological abnormalities (i.e. seizure)

1 ( ) yes, describe, ______________

2 ( ) no

14. Area of head injury, identify ______________________

15. Additional injuries

1 ( ) yes, describe ______________

2 ( ) no

16. Medical disease history (e.g., hypertension, diabetes mellitus)

1 ( ) yes, describe, ______________

2 ( ) no

14. Current medications of medical disease history

1 ( ) yes, describe, _______________

2 ( ) no

APPENDIX C

The Rivermead Post Concussion Symptom Questionnaire (RPQ)

Direction: The following is a list of symptoms that you may have experienced. Please check list (√) on each symptom that you experienced in the previous week. If you do not have symptom, you will not complete how often and how severe of this symptom. If you choose "yes", please identify **how often** you experience the symptom, **how severe** it was.

How often?
1 = Rarely
2 = A little → symptom occurs 1-2 days/week
3 = Occasionally → symptom occurs 3-4 days/week
4 = Most times → symptom occurs 5-7 days/week

How severe?
0 = not severe, 1 = slightly severe, 2 = moderately severe, 3 = severe, 4 = very severe

Items	No	Yes	How often				How severe				
				A little	Occasionally		Not severe		Moderate severe	Severe	
			(1)	**(2)**	**(3)**	**(4)**	**(0)**	**(1)**	**(2)**	**(3)**	**(4)**
1. Headaches											
2. Feeling of dizziness											
3. Fatigue, tiring more easily											
4. Forgetfulness, poor memory											
5. Poor concentration											
6. Taking longer to think											
7. Restlessness/anxiety											
8. Feeling depressed or tearful											
9. Sleep disturbance											
10. Nausea and /or vomiting											
11. Being irritable, easily angered											
12. Feeling frustration or impatient											
13. Noise sensitivity (easy upset by loud noise)											
14. Light sensitivity (easily upset by bright light)											
15. Blurred vision											
16. Double vision											
17. Others _______________											

APPENDIX D

Symptom Self-management Scale adapted for TBI (SSMS-TBI)

Direction:

1. Please review your **symptom management strategies** that you use to manage for each symptom in the past one week. For the symptom management strategies that you used, please identify **how often used the strategy** and **does it work** to reduce the symptom. Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies.

2. There are available 6 forms, including 1) headache, 2) dizziness, 3) fatigue, 4) difficulty thinking/memory difficulties for who were reported forgetfulness, taking longer to think, and poor concentration, 5) anxiety, and 6) depression. For other symptoms you have that are not listed, please write your management strategies on the blank form provided.

How often used?

(0) = Never used;

(1) = Rarely used (1-2 days/ week)

(2) = Occasionally (3-4 days/week)

(3) = Most times(5-7 day/week)

Does it work?

(0) = Never → never success to reduce the symptom

(1) = Rarely → most time unsuccessful

(2) = Sometimes

(3) = Often → most time success to reduce the symptom

(4) = Always

1. Headache : pain or tension in the head

Symptom management strategies for headache: Here are some things people may do for Headache. Please review the list and:

1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Relaxation techniques	0	1	2	3	0	1	2	3	4				
Close eyes	0	1	2	3	0	1	2	3	4				
Lay down	0	1	2	3	0	1	2	3	4				
Hot/Cold compresses	0	1	2	3	0	1	2	3	4				
Think reassuring thoughts	0	1	2	3	0	1	2	3	4				
Exercise													
Walking	0	1	2	3	0	1	2	3	4				
Other Exercising, list ______________	0	1	2	3	0	1	2	3	4				
Medications													
Prescribed anti-epileptic agent, list ___	0	1	2	3	0	1	2	3	4				
Prescribed pain medicine, list _______	0	1	2	3	0	1	2	3	4				
Over-the-counter medications, list ___	0	1	2	3	0	1	2	3	4				

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4		… you perform it?		
Nutrition													
Vitamins, list ______________	0	1	2	3	0	1	2	3	4				
Herbal supplements, list ______________	0	1	2	3	0	1	2	3	4				
Complementary Therapies													
Massage	0	1	2	3	0	1	2	3	4				
Reflexology therapy	0	1	2	3	0	1	2	3	4				
Dzikir	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where_________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
______________________________	0	1	2	3	0	1	2	3	4				
______________________________	0	1	2	3	0	1	2	3	4				

2. Dizziness- a feeling as if the room is spinning or that you are losing your balance. This is sometimes called vertigo by healthcare providers.

Symptom management strategies for dizziness: Here are some things people may do for Dizziness. Please review the list and:

1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Talking with other													
family& friends	0	1	2	3	0	1	2	3	4				
health care provider	0	1	2	3	0	1	2	3	4				
other persons with brain injury	0	1	2	3	0	1	2	3	4				
Don't dwell on it	0	1	2	3	0	1	2	3	4				
Practice balancing	0	1	2	3	0	1	2	3	4				
Medications													
Prescribed medicine for dizziness, list __	0	1	2	3	0	1	2	3	4				
Over the counter medicine	0	1	2	3	0	1	2	3	4				
Nutrition													
Vitamins/herbs, list ____	0	1	2	3	0	1	2	3	4				
Low salt diet	0	1	2	3	0	1	2	3	4				

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Being Prepared													
Get up slowly	0	1	2	3	0	1	2	3	4				
Move slowly	0	1	2	3	0	1	2	3	4				
Hold on to things for support	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where_________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
______________________________	0	1	2	3	0	1	2	3	4				
______________________________	0	1	2	3	0	1	2	3	4				

3. Fatigue - feeling tired, weary, or exhausted.

Symptom management strategies for fatigue: Here are some things people may do for fatigue. Please review the list and:
1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Get enough sleep	0	1	2	3	0	1	2	3	4				
Take frequent breaks	0	1	2	3	0	1	2	3	4				
Adjust social activities	0	1	2	3	0	1	2	3	4				
Not get stressed out	0	1	2	3	0	1	2	3	4				
Nap during the day	0	1	2	3	0	1	2	3	4				
Exercise													
Walking	0	1	2	3	0	1	2	3	4				
Other Exercising, list ______________	0	1	2	3	0	1	2	3	4				
Complementary Therapies													
Acupuncture	0	1	2	3	0	1	2	3	4				
Praying	0	1	2	3	0	1	2	3	4				
Massage	0	1	2	3	0	1	2	3	4				

	How often used				Does it work?								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Nutrition													
Vitamins, list ______________	0	1	2	3	0	1	2	3	4				
Mineral, list ______________	0	1	2	3	0	1	2	3	4				
Amino acids	0	1	2	3	0	1	2	3	4				
Herbs	0	1	2	3	0	1	2	3	4				
Eating well	0	1	2	3	0	1	2	3	4				
Medications													
Prescribed medication, list ___	0	1	2	3	0	1	2	3	4				
Over-the-counter sleep aids	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where_________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
______________________________	0	1	2	3	0	1	2	3	4				
______________________________	0	1	2	3	0	1	2	3	4				

4. Thinking/ memory difficulties - problems remembering things, problems concentrating, feeling mentally foggy, thinking slowly.

Symptom management strategies for memory difficulties: Here are some things people may do for problems with memory or concentration. Please review the list and:

1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

Strategies	**How often used**				**Does it work?**								
	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Get enough sleep	0	1	2	3	0	1	2	3	4				
Take frequent breaks	0	1	2	3	0	1	2	3	4				
Talk with others	0	1	2	3	0	1	2	3	4				
Adjust work/school activities	0	1	2	3	0	1	2	3	4				
Make lists	0	1	2	3	0	1	2	3	4				
Use calendar	0	1	2	3	0	1	2	3	4				
Practice remembering	0	1	2	3	0	1	2	3	4				
Exercise													
Walking	0	1	2	3	0	1	2	3	4				
Other Exercising, list ______________	0	1	2	3	0	1	2	3	4				
Complementary Therapies													
Praying	0	1	2	3	0	1	2	3	4				
Massage	0	1	2	3	0	1	2	3	4				

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Nutrition													
Vitamins, list ______________	0	1	2	3	0	1	2	3	4				
Herbs, list ________________	0	1	2	3	0	1	2	3	4				
Eating well	0	1	2	3	0	1	2	3	4				
Medications													
Prescribed medication, list ___	0	1	2	3	0	1	2	3	4				
Over-the-counter medicine	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where_________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
______________________________	0	1	2	3	0	1	2	3	4				
______________________________	0	1	2	3	0	1	2	3	4				

5. Restlessness/Anxiety - worrisome thoughts or feelings of panic

Symptom management strategies for anxiety: Here are some things people may do for anxiety. Please review the list and:

1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you.
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Talking with other													
family& friends	0	1	2	3	0	1	2	3	4				
health care provider	0	1	2	3	0	1	2	3	4				
others persons with brain injury	0	1	2	3	0	1	2	3	4				
Denial or try not to think	0	1	2	3	0	1	2	3	4				
Cry	0	1	2	3	0	1	2	3	4				
Stay alone	0	1	2	3	0	1	2	3	4				
Talk myself through it	0	1	2	3	0	1	2	3	4				
Watch television	0	1	2	3	0	1	2	3	4				
Playing cards	0	1	2	3	0	1	2	3	4				
Read	0	1	2	3	0	1	2	3	4				
Cook	0	1	2	3	0	1	2	3	4				
Exercise													
Walking	0	1	2	3	0	1	2	3	4				
Other exercising, list ______________	0	1	2	3	0	1	2	3	4				

Strategies	How often used				Does it work?					Why	When	Where	Who help
	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always				
	0	1	2	3	0	1	2	3	4	… you perform it?			
Medications													
Prescribed anti-anxiety agent, list ____	0	1	2	3	0	1	2	3	4				
Over medication for anxiety, list _____	0	1	2	3	0	1	2	3	4				
Complementary Therapies													
Dzikir	0	1	2	3	0	1	2	3	4				
Praying	0	1	2	3	0	1	2	3	4				
Relaxation techniques	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
____________________________	0	1	2	3	0	1	2	3	4				
____________________________	0	1	2	3	0	1	2	3	4				

6. Depression -feeling blue, low, depressed or sad

Symptom management strategies for depression: Here are some things people may do for depression. Please review the list and:

1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you.
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Activities/Thoughts													
Talking with other													
family& friends	0	1	2	3	0	1	2	3	4				
health care provider	0	1	2	3	0	1	2	3	4				
others persons with brain injury	0	1	2	3	0	1	2	3	4				
Avoid negative or annoying things	0	1	2	3	0	1	2	3	4				
Go to work	0	1	2	3	0	1	2	3	4				
Do things I enjoy	0	1	2	3	0	1	2	3	4				
Keep busy	0	1	2	3	0	1	2	3	4				
Draw	0	1	2	3	0	1	2	3	4				
Read	0	1	2	3	0	1	2	3	4				
Listen to music	0	1	2	3	0	1	2	3	4				
Exercise													
Walking	0	1	2	3	0	1	2	3	4				
Other exercising, list ______________	0	1	2	3	0	1	2	3	4				

Strategies	**How often used**				**Does it work?**								
	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
Medications													
Prescribed anti-anxiety agent, list ____	0	1	2	3	0	1	2	3	4				
Over medication for anxiety, list _____	0	1	2	3	0	1	2	3	4				
Complementary therapies													
Dzikir	0	1	2	3	0	1	2	3	4				
Praying	0	1	2	3	0	1	2	3	4				
Substance Use													
Cigarettes	0	1	2	3	0	1	2	3	4				
Alcohol	0	1	2	3	0	1	2	3	4				
Healthcare Services													
See doctor	0	1	2	3	0	1	2	3	4				
See other healthcare provider, list ___	0	1	2	3	0	1	2	3	4				
Seek information/education about this symptom, where__________________	0	1	2	3	0	1	2	3	4				
Others you may wish to add													
______________________________	0	1	2	3	0	1	2	3	4				
______________________________	0	1	2	3	0	1	2	3	4				

Symptom: ______________________

Please identify what you did to reduce this symptom, then:
1) Circle how often you use this strategy
2) If you use the strategy, circle the number to rate how well it works for you.
3) Then, please explain the reason why you use these strategies, when and where and have anyone help you to perform the strategies

	How often used				**Does it work?**								
Strategies	Never	Rarely used	Occasionally	Most times	Never	Rarely	Sometimes	Often	Always	Why	When	Where	Who help
	0	1	2	3	0	1	2	3	4	… you perform it?			
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				
………………………………………	0	1	2	3	0	1	2	3	4				

APPENDIX E

The Quality of Life after Brain Injury Overall Scale (QOLIBRI-OS)

Description: We would like to know **how satisfied** you are with diffent aspects of your life since your brain injury. For each question please choose the answer which is closest to how you feel overall in the previous week and now) and give the check list (√) on the column that best fit to you.

(1) = Not satisfied at all
(2) = Slightly satisfied
(3) =Moderately satisfied
(4) = Quite satisfied
(5) = Very satisfied

Items	Not satisfied at all (1)	Slightly satisfied (2)	Moderately satisfied (3)	Quite satisfied (4)	Very satisfied (5)
1. **Overall,** how satisfied are you with your physical condition?					
2. **Overall**, how satisfied are you with how your brain is working, in terms of your concentration, memory, and thinking?					
3. **Overall,** how satisfied are you with your feeling and emotions?					
4. **Overall**, how satisfied are you with your ability to carry out day to day activities?					
5. **Overall**, how satisfied are you with your personal and social life?					
6. **Overall**, how satisfied are you with your current situation and future prospects?					

APPENDIX F

List of Experts

Three experts examined the content validity of the instruments including demographic data and health-related data, the Rivermead Post Concussion Symptoms Questionnaire (RPQ), the Symptom Self Management Scale adapted for TBI (SSMS-TBI) and the Quality of Life after Brain Injury Overall Scale (QOLIBRI-OS) questionnaire, they were:

1. Prapun Somporn, M. D. A neurosurgeon, Hatyai Hospital, Thailand
2. Miss. Jintana Damkliang, A nursing Lecturer, Surgical Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand
3. Miss. Narumon Anumas, APN Neurosurgical intensive care unit, Hatyai Hospital, Thailand

APPENDIX G

Permission of the Instrument RPQ

RE: Asking permission for using the Rivermead Post Concussion Symptom Questionnaire

From: Nigel King
To : FikriyantiNawieSyahza

The RPQ is free to use – so I am more than happy for it to be used in your study.
Good luck and kind regards.
Dr Nigel King

From: FikriyantiNawieSyahza [mailto:fikri_1920@yahoo.co.id]
Sent: 29 May 2013 11:46
To: Nigel King
Subject: Asking permission for using the Rivermead Post Concussion Symptom Questionnaire

Dear Dr Nigel King

I am Fikriyanti, a Master student of Faculty of Nursing (International Program), Prince of Songkla University, Thailand. My major is in Adult Nursing (Surgical) and I am interested in MTBI population. I am doing my thesis to complete my degree entitled: "Post concussion symptoms (PCS), PCS management and Quality of Life of persons with mTBI in Indonesia" Based on my literature review about Post concussion symptoms in persons with mTBI, I and my advisory committee very interest to use the Rivermead Post concussion Symptom Questionnaire (RPQ) to assess the persons' symptoms. And as I know, RPQ is a very well-known instrument which is used to assess the PCS in the MTBI population. Therefore, I would like to ask your permission as the author of this questionnaire.

I would like to say thank you very much for your attention and kind consideration. I look forward to hearing from you.

Kind regard
Fikriyanti
Mobile phone: +669-0074-8131

My Advisor: LuppanaKitrungrote, RN, PhD. (luppana.k@psu.ac.th)
Faculty of Nursing, Prince of Songkla University Hat-Yai, Songkhla, Thailand 90112
Office phone: 074-286415 Mobile Phone: +668-9647-8910

APPENDIX H

Permission of the Instrument SSMS-TBI

RE: Asking permission for Symptom Self-management Scale adapted for TBI (SSMS-TBI)

From : FikriyantiNawieSyahza
To : Karen Bergman

Thanks a lot for your kindness.

Kind regards
Fikriyanti

From : Karen Bergman <BERGMANK@bronsonhg.org>
To : FikriyantiNawieSyahza<fikri_1920@yahoo.co.id>
Send : Tuesday, 18 September 2012 22:49
Subject : RE: Asking permission for Symptom Self-management Scale adapted for TBI (SSMS-TBI)

Here is the symptom self care measure.

I hope your research does well,

Karen Bergman RN PhD CNRN

From: FikriyantiNawieSyahza [mail to: fikri_1920@yahoo.co.id]
Sent: Monday, September 10, 2012 11:54 AM
To: Karen Bergman
Cc: AjLupana
Subject: RE: Asking permission for Symptom Self-management Scale adapted for TBI (SSMS-TBI)

Dear Dr. Karen Bergman, RN

I would like to say thank you very much for your kindness.

Kind regard
Fikriyanti

From: Karen Bergman <BERGMANK@bronsonhg.org>
To : FikriyantiNawieSyahza<fikri_1920@yahoo.co.id>
Send : Monday, 10 September 2012 20:18

Subject : RE: Asking permission for Symptom Self-management Scale adapted for TBI (SSMS-TBI)

Yes I will give this to you. I need a couple of days as I have it on my work computer and will not be there for a few more days,

Karen Bergman

From: FikriyantiNawieSyahza [fikri_1920@yahoo.co.id]
Sent: Friday, September 07, 2012 10:10 PM
To: Karen Bergman
Cc: Ajlupana
Subject: Asking permission for Symptom Self-management Scale adapted for TBI (SSMS-TBI)
Dear Dr. Karen Bergman, RN

I am Fikriyanti, a Master student of Faculty of Nursing (International Program), Prince of Songkla University, Thailand. My major is in Adult Nursing (Surgical) and I am interested in MTBI population. I am going to conduct my thesis to complete my degree entitled: "Post concussion symptoms (PCS), PCS management and Quality of Life of persons with mTBI in Indonesia" Based on my literature review about symptom management measurement, I and my advisory committee very interest to use the Symptom Self-management Scale adapted for TBI (SSMS-TBI) to measure PCS management of MTBI person in Indonesia. Therefore, I ask your permission as the author of this questionnaire.

I hope you give me permission and the full of the questionnaire. I would like to say thank you very much for your attention and kind consideration. I look forward to hearing from you.

Kind regard
Fikriyanti
Mobile phone: +669-0074-8131

My Advisor: Luppana Kitrungrote, RN, PhD. (luppana.k@psu.ac.th)
Faculty of Nursing, Prince of Songkla University Hat-Yai, Songkhla, Thailand 90112
Office phone: 074-286415 Mobile Phone: +668-9647-8910

APPENDIX I

Permission of the Instrument QOLIBRI-OS

RE: Asking permission for QOLIBRI-OS

From : FikriyantiNawieSyahza
To : Nicole von Steinbüchel

Dear Prof. Dr. Nicole von Steinbüchel

Thank you so much for your attention. About translation, I would like to translate by expert in Aceh, Indonesia. She is a lecturer in adult nursing area, at Syiah Kuala University, Aceh Indonesia. I will use back translation techniques to see if there any different between first version and after translated back to English version (version 2). Hopefully, my data collection period will be done smoothly.

Kind regards
Fikriyanti

From: Nicole von Steinbüchel<nvsteinbuechel@med.uni-goettingen.de>
To: FikriyantiNawieSyahza<fikri_1920@yahoo.co.id>; Klaus Prof. Dr. Klaus von Wild <kvw@neurosci.de>
Send: Thursday, 14 Maret 2013 1:31
Subject: Re: Asking permission for QOLIBRI-OS

Dear Mrs. Fikriyanti,

a very good idea, however the QOLIBRI has to be translated first professionally. Dr. Eko started with this. However I have no idea how far he is with the project.

All the best

NvSteinbüchel
Am 13.03.2013 um 04:05 schriebFikriyantiNawieSyahza:

Dear Prof. Dr. Nicole von Steinbüchel

I am Fikriyanti, a Master student of Faculty of Nursing (International Program), Prince of Songkla University, Thailand. My major is in Adult Nursing (Surgical) and I am interested in MTBI population. I am going to conduct my thesis to complete my degree entitled: "Post concussion symptoms (PCS), PCS management and Quality of Life of persons with mTBI in Indonesia" Based on my literature review about quality of life in traumatic brain injury, I and my advisory committee very interest to use QOLIBRI to measure Quality of Life of persons with mTBI in Indonesia. And as I know, the QOLIBRI is the only one measurement that develop to measure quality of life of persons with TBI. Therefore, I ask your permission as the author of this questionnaire.

I would like to say thank you very much for your attention and kind consideration. I look forward to hearing from you.

Kind regard
Fikriyanti
Mobile phone: +669-0074-8131

My Advisor: Luppana Kitrungrote, RN, PhD. (luppana.k@psu.ac.th)
Faculty of Nursing, Prince of Songkla University Hat-Yai, Songkhla, Thailand 90112
Office phone: 074-286415 Mobile Phone: +668-9647-8910

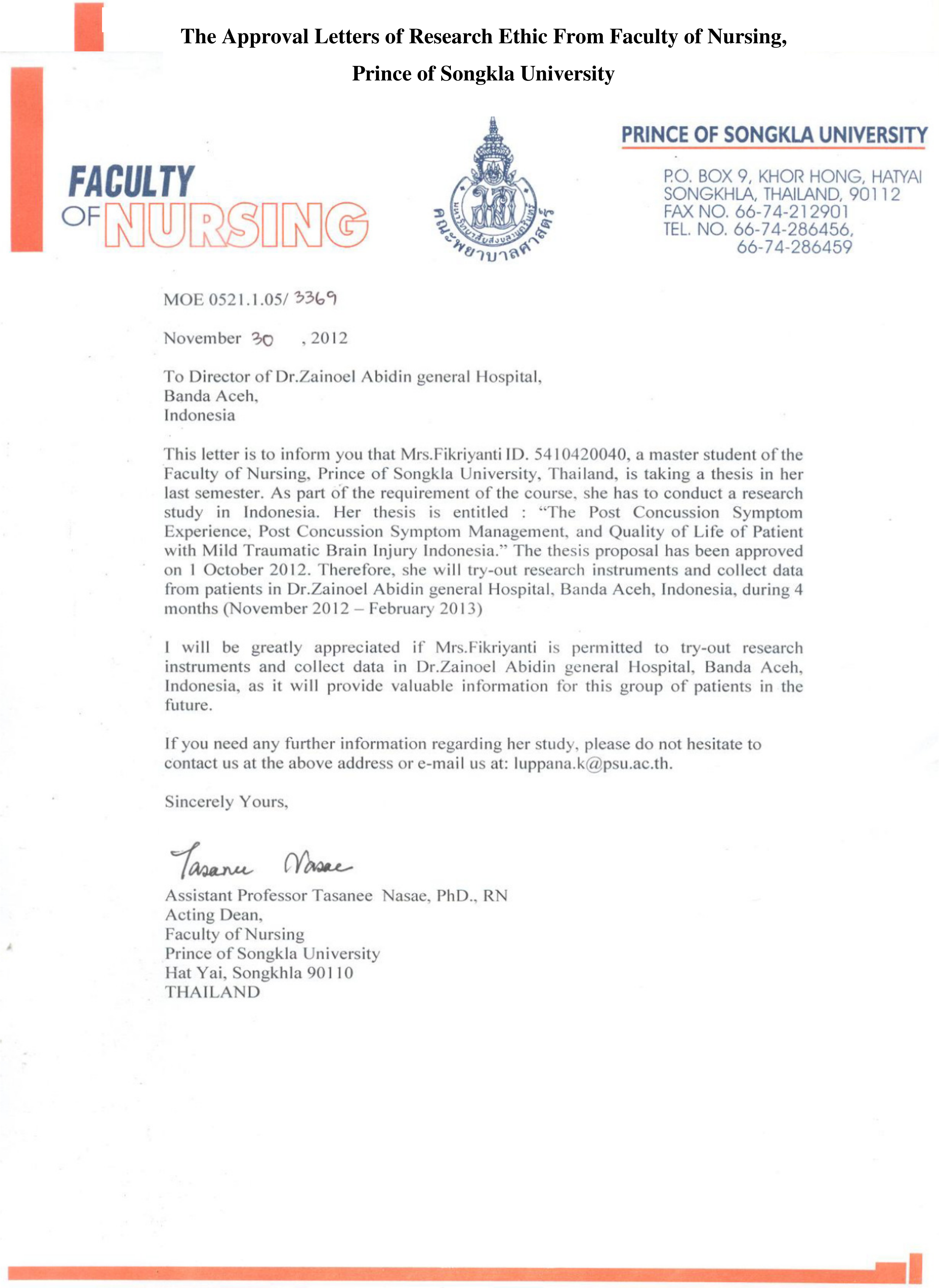
Prof. Dr. Nicole von Steinbüchel
Head of Department
Professor of Medical Psychology and Medical Sociology

University Medical Center Göttingen
Georg-August-University
Department of Medical Psychology and Medical Sociology
Waldweg 37
37073 Göttingen
Germany

Phone +49 / (0)551 / 39-8197
Fax +49 / (0)551 / 39-8194
Cell +49 / (0)15112049316

APPENDIX J

The Approval Letters of Research Ethic From Faculty of Nursing, Prince of Songkla University



FACULTY
OF NURSING

PRINCE OF SONGKLA UNIVERSITY
P.O. BOX 9, KHOR HONG, HATYAI
SONGKHLA, THAILAND, 90112
FAX NO. 66-74-212901
TEL. NO. 66-74-286456,
66-74-286459

MOE 0521.1.05/ 3369

November 30 , 2012

To Director of Dr.Zainoel Abidin general Hospital,
Banda Aceh,
Indonesia

This letter is to inform you that Mrs.Fikriyanti ID. 5410420040, a master student of the Faculty of Nursing, Prince of Songkla University, Thailand, is taking a thesis in her last semester. As part of the requirement of the course, she has to conduct a research study in Indonesia. Her thesis is entitled : "The Post Concussion Symptom Experience, Post Concussion Symptom Management, and Quality of Life of Patient with Mild Traumatic Brain Injury Indonesia." The thesis proposal has been approved on 1 October 2012. Therefore, she will try-out research instruments and collect data from patients in Dr.Zainoel Abidin general Hospital, Banda Aceh, Indonesia, during 4 months (November 2012 – February 2013)

I will be greatly appreciated if Mrs.Fikriyanti is permitted to try-out research instruments and collect data in Dr.Zainoel Abidin general Hospital, Banda Aceh, Indonesia, as it will provide valuable information for this group of patients in the future.

If you need any further information regarding her study, please do not hesitate to contact us at the above address or e-mail us at: luppana.k@psu.ac.th.

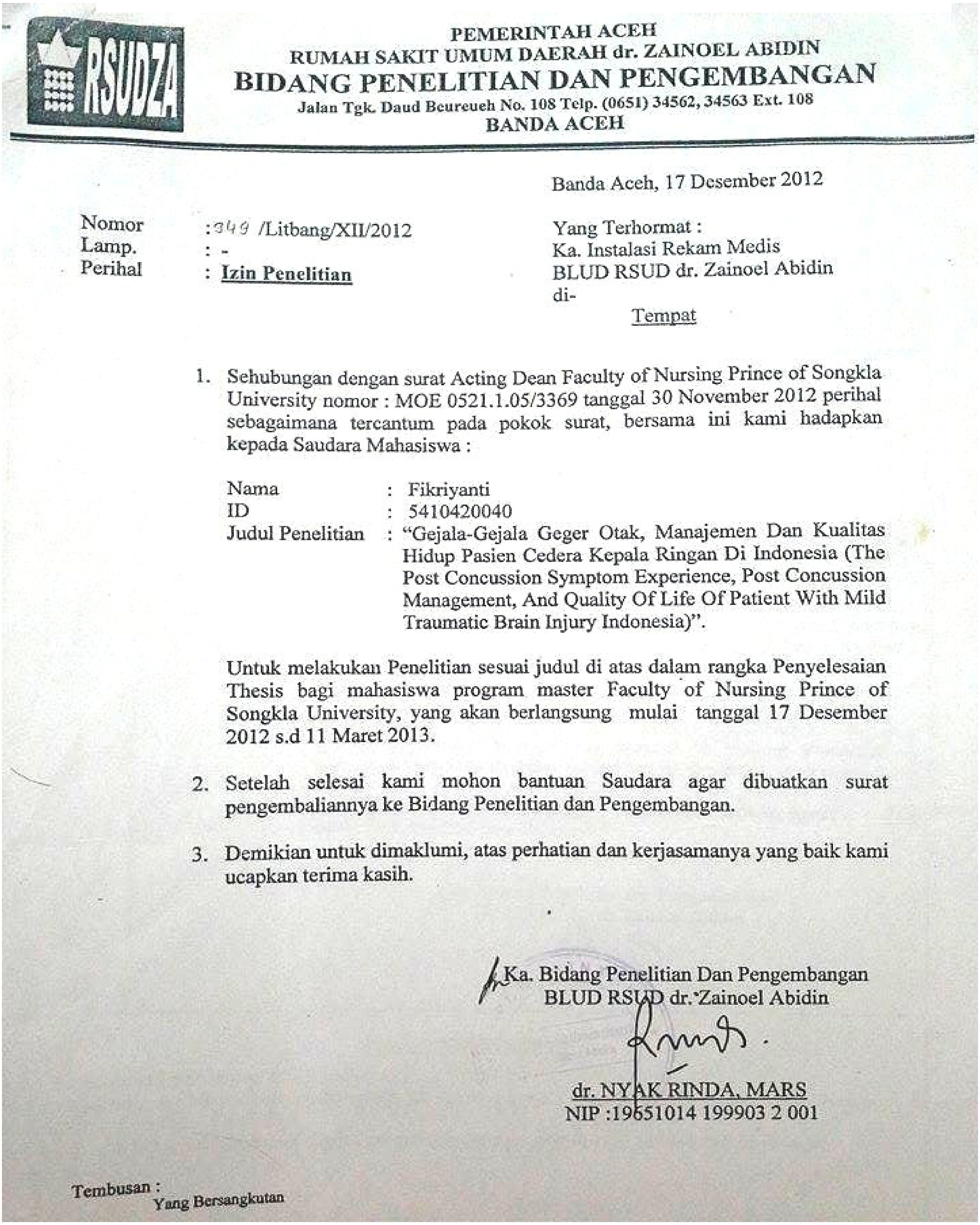
Sincerely Yours,

Tasanee Nasae

Assistant Professor Tasanee Nasae, PhD., RN
Acting Dean,
Faculty of Nursing
Prince of Songkla University
Hat Yai, Songkhla 90110
THAILAND

APPENDIX K

The Approval Letter of the Director from dr. Zainoel Abidin Hospital and Meuraxa Hospital



RSUDZA

PEMERINTAH ACEH
RUMAH SAKIT UMUM DAERAH dr. ZAINOEL ABIDIN
BIDANG PENELITIAN DAN PENGEMBANGAN
Jalan Tgk. Daud Beureueh No. 108 Telp. (0651) 34562, 34563 Ext. 108
BANDA ACEH

Banda Aceh, 17 Desember 2012

Nomor : 349 /Litbang/XII/2012
Lamp. : -
Perihal : **Izin Penelitian**

Yang Terhormat :
Ka. Instalasi Rekam Medis
BLUD RSUD dr. Zainoel Abidin
di-
Tempat

1. Sehubungan dengan surat Acting Dean Faculty of Nursing Prince of Songkla University nomor : MOE 0521.1.05/3369 tanggal 30 November 2012 perihal sebagaimana tercantum pada pokok surat, bersama ini kami hadapkan kepada Saudara Mahasiswa :

   Nama : Fikriyanti
   ID : 5410420040
   Judul Penelitian : "Gejala-Gejala Geger Otak, Manajemen Dan Kualitas Hidup Pasien Cedera Kepala Ringan Di Indonesia (The Post Concussion Symptom Experience, Post Concussion Management, And Quality Of Life Of Patient With Mild Traumatic Brain Injury Indonesia)".

   Untuk melakukan Penelitian sesuai judul di atas dalam rangka Penyelesaian Thesis bagi mahasiswa program master Faculty of Nursing Prince of Songkla University, yang akan berlangsung mulai tanggal 17 Desember 2012 s.d 11 Maret 2013.

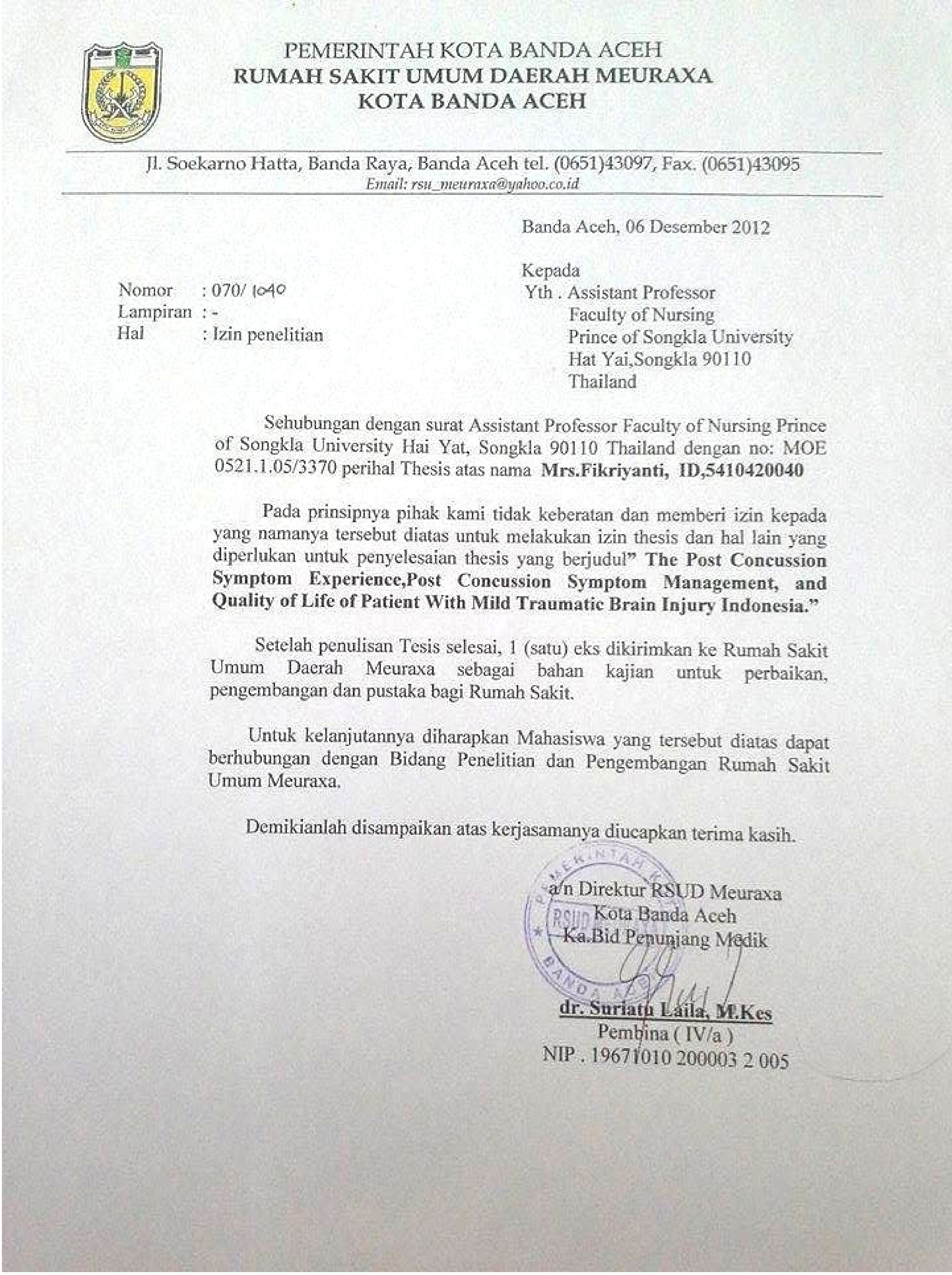
2. Setelah selesai kami mohon bantuan Saudara agar dibuatkan surat pengembaliannya ke Bidang Penelitian dan Pengembangan.

3. Demikian untuk dimaklumi, atas perhatian dan kerjasamanya yang baik kami ucapkan terima kasih.

An. Ka. Bidang Penelitian Dan Pengembangan
BLUD RSUD dr. Zainoel Abidin

dr. NYAK RINDA, MARS
NIP :19651014 199903 2 001

Tembusan :
Yang Bersangkutan



PEMERINTAH KOTA BANDA ACEH
RUMAH SAKIT UMUM DAERAH MEURAXA
KOTA BANDA ACEH

Jl. Soekarno Hatta, Banda Raya, Banda Aceh tel. (0651)43097, Fax. (0651)43095
Email: rsu_meuraxa@yahoo.co.id

Banda Aceh, 06 Desember 2012

Kepada
Yth . Assistant Professor
Faculty of Nursing
Prince of Songkla University
Hat Yai,Songkla 90110
Thailand

Nomor : 070/ 1040
Lampiran : -
Hal : Izin penelitian

Sehubungan dengan surat Assistant Professor Faculty of Nursing Prince of Songkla University Hai Yat, Songkla 90110 Thailand dengan no: MOE 0521.1.05/3370 perihal Thesis atas nama **Mrs.Fikriyanti, ID,5410420040**

Pada prinsipnya pihak kami tidak keberatan dan memberi izin kepada yang namanya tersebut diatas untuk melakukan izin thesis dan hal lain yang diperlukan untuk penyelesaian thesis yang berjudul" **The Post Concussion Symptom Experience,Post Concussion Symptom Management, and Quality of Life of Patient With Mild Traumatic Brain Injury Indonesia."**

Setelah penulisan Tesis selesai, 1 (satu) eks dikirimkan ke Rumah Sakit Umum Daerah Meuraxa sebagai bahan kajian untuk perbaikan, pengembangan dan pustaka bagi Rumah Sakit.

Untuk kelanjutannya diharapkan Mahasiswa yang tersebut diatas dapat berhubungan dengan Bidang Penelitian dan Pengembangan Rumah Sakit Umum Meuraxa.

Demikianlah disampaikan atas kerjasamanya diucapkan terima kasih.

a/n Direktur RSUD Meuraxa
Kota Banda Aceh
Ka.Bid Penunjang Medik

dr. Suriatu Laila, M.Kes
Pembina (IV/a)
NIP . 19671010 200003 2 005

VITAE

Name : Mrs.Fikriyanti
Student ID : 5410420040

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing Science	Syiah Kuala University	2009

Scholarship Awards during Enrolment

2011-2013	Aceh Scholarship Commission, Indonesia

Work – Position and Address

Work position	Nursing Lecturer of Faculty of Nursing, Syiah Kuala University, Aceh, Indonesia
Address	Banda Aceh, Indonesia
Phone	+628527707112
Email	fikri_1920@yahoo.co.id 5410420040@email.psu.ac.th

List of Publication and Proceeding

Fikriyanti., Kitrungrote, L., & Songwathana, P. (in press). The post concussion symptom experience and quality of life in Indonesian persons with mild traumatic brain injury. *Songklanagarind Journal of Nursing.*