Development and Evaluation of Clinical Nursing Practice Guideline of Tactile Stimulation for Preterm Infants in the Neonatal Moderate Care Unit

Natthaya Cherngchalard

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Thesis Title	Development and Evaluation of Clinical Nursing Practice Guideline of Tactile Stimulation for Preterm Infants in the Neonatal Moderate Care Unit
Author	Miss Natthaya Cherngchalard
Major Program	Nursing Science (International Program)

Major Advisor:

…..……..
(Asst. Prof. Dr. Kaitsara Sen-ngam)

Co-advisor:

…..……..
(Asst. Prof. Dr. Busakorn Punthmatharith)

Examining Committee:

…….……Chairperson
(Asst. Prof. Dr. Wongchan Petpichetchian)

…...…….…….
(Asst. Prof. Dr. Kaitsara Sen-ngam)

…..…...…….…….….
(Asst. Prof. Dr. Busakorn Punthmatharith)

...…….…….
(Asst. Prof. Dr. Rachtawon Orapiriyakul)

...…….…….……..
(Narongsak Nakwan, M.D.)

The Graduate School, Prince of Songkla University, has approved this thesis as partial fulfillment of the requirements for the Master of Nursing Science (International Program).

..…….….
(Prof. Dr. Amornrat Phongdara)

Dean of Graduate School

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ABSTRACT

This developmental study aimed to develop and evaluate a clinical nursing practice guideline of tactile stimulation (CNPG-TS) for preterm infants in the Neonatal Moderate Care Unit (NMCU), Songklanagarind Hospital. The CNPG-TS was developed based on related scientific evidence regarding tactile stimulation and a group discussion with five CNPG-TS development panelists. It consisted of five guidelines, five sub-guidelines, and 95 statements: 1) Criteria to select preterm infants for providing appropriate tactile stimulation techniques (5 statements), 2) Appropriate environmental management in providing tactile stimulation to preterm infants (3 sub-guidelines, 36 statements), 3) Evaluating preterm infants readiness and management before receiving tactile stimulation (7 statements), 4) Evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile stimulation and management (6 statements), and 5) Methods of tactile stimulation (2 sub-guidelines, 41 statements). The content validity of the developed CNPG-TS was assessed by three experts. The practicability of the developed CNPG-TS was assessed by 14 nurses and 40 preterm infants using the nurse's practicability questionnaire and was evaluated based on criteria for testing process standards

utilizing Mason's technique (Mason, 1994). Fourteen nurses employed the developed CNPG-TS on 40 preterm infants divided into 4 sub-groups: 10 preterm infants in incubators who received the Gentle Human Touch (GHT) (group 1), 10 preterm infants in incubators who received the Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) (group 2), 10 preterm infants in cribs who received GHT (group 3), and 10 preterm infants in cribs who received ATVV (group 4). The data was analyzed in terms of frequency and percentage.

The results showed that all nurses could practice 100% accurately 86 of 95 statements of the CNPG-TS with all preterm infants. There were 6 statements (statement 5, sub-guideline 2.3; statement 16, sub-guideline 2.3; statement 17, sub-guideline 2.3; statement 2, guideline 3; statement 7, guideline 3; and statement 6, guideline 4) that only 20-80% of nurses could practice because of limited occurrences of those events or situations. The other three statements (statement 6, sub-guideline 2.3; statement 7, sub-guideline 2.3; and statement 5, guideline 3) were not available to be practiced because of no actual occurrences of those events or situations. However, these nine statements were still included in the CNPG-TS as optional statements. Thus, the developed CNPG-TS for preterm infants can be used as a tool for NMCU nurses to make decisions and to control the quality of providing developmental care through effective tactile stimulation to preterm infants.

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CHAPTER 1

INTRODUCTION

Background and Significance of the Problem

A preterm infant is one who is born before the completion of 37 weeks of gestation (Askin & Wilson, 2007). Although medical science is very advanced, the incidence of preterm birth is a major problem worldwide. In the United States in 2003, preterm births accounted for 12.1% of the total live births, and the rate increased to 12.3% in 2005 (Martin, Kochanek, Strobino, Guver, & MacDorman, 2006). In Thailand, Department of Health, Ministry of Public Health (2010), disclosed that each year there are about 800,000 births of which about 8-10% (64,000-80,000 births) are preterm births at gestational age 28-37 weeks (Department of Health, Ministry of Public Health, 2010). According to the statistics of Songklanagarind Hospital, preterm births accounted for 10.2% of all total births in this hospital (Medical Statistical Department of Songklanagarind Hospital, 2011). The statistical record of the neonatal intensive/ moderate care unit of this hospital also showed that there were 221, 249, and 270 cases of preterm infants admitted in the years 2009, 2010, and 2011 respectively representing approximately 81.9%, 84.3%, and 84.9% of all total newborn cases per year (Neonatal Intensive/Moderate Care Unit, 2011).

Nowadays, the prospect of the survival of the preterm infant is increasing due to advanced medical treatment technology (Lutes, Graves, & Jorgensen, 2004). Nevertheless, premature birth resulting in their anatomic and physiologic immaturity and instability causes them to be at high risk in developing post-birth complications of neurological, hematologic, cardiovascular, respiratory, gastrointestinal and metabolic,

and infectious diseases (Harrison, Lotas, & Jorgensen, 2004). Meanwhile, caring activities of these preterm infants during this stage includes controlling body temperature, promoting sleep and reducing external stimuli to conserve energy for growth, and preventing hypoglycemia and infection (Askin, & Wilson, 2007). While undergoing these activities, the preterm infants were closely observed and cared for in an incubator or a crib separately in the Neonatal Moderate Care Unit (NMCU).

When infants are born prematurely or when receiving care at the NMCU after passing the critical period, comfortable tactile and vestibular stimulations are significantly reduced while auditory, visual, and procedural tactile stimulations are continuously increased (Faure & Richardson, 2002). Moreover, because of their preterm birth, these infants also experience discontinuous appropriate sensory stimulation otherwise received from maternal uterus (Blackwell, 2000; White-Traut, 1993). Unfortunately, these inappropriate stimulations within the NMCU contributes toward growth and developmental problems in preterm infants such as failure to thrive, delay of sensory development, delay of autonomic nervous system, sleep-awake pattern disorganization, and the delay of attention to the environment (Garner & Goldson, 2006; Kessenich, 2003). Preterm infants also require appropriate continuous sensory stimulation to prevent growth and developmental problems. Thus, appropriate sensory stimulation is one of the developmental interventions that NMCU nurses should obviuosly provide to these infants continuously when admitted to the NMCU (Catlett & Holkitch-Davis, 1990; Faure & Richardson).

A wide variety of sensory stimulations has been found to be beneficial for preterm infants. However, tactile stimulation was selected to be a primary element of neonatal care as it is one of the first senses to develop in the fetus (Lutes, Graves, &

Jorgensen, 2004). The tactile sense of preterm infants needs to be continuously maintained and appropriately stimulated in order to reach normal growth and development (Hadley & West, 1999; Srisuparp, 2002). Tactile stimulation as developmental care is a procedure with gentle, light, and systematic skin-to-skin therapy which is based on the preterm infant's needs and individual behavior responses (Garcia & White-Traut, 1993).

Tactile stimulations have been used primarily for study purposes in order to assess their appropriateness and effectiveness to promote growth and the development of growing preterm infants. According to existing studies, tactile stimulation is a significant intervention for promoting physical growth, emotional and neurological development of preterm infants. Tactile stimulation has immediate effect in promoting tranquility during sleep and alertness during wakeful periods respectively, (Field, 1998; Harrison, Williams, Berbaum, Stem, & Leeper, 2000; White-Traut, Nelson, & Silvestri, 1997), promoting maturity of habituation, orientation, and a feeling of security to restore a state of well-being (Mathai, Fernadez, Mondkar, & Kanbur, 2001; White-Traut, Nelson, & Silvestri), reducing behavioral distress (Harrison, Williams, Berbaum, Stem, & Leeper; Solkoff & Matuszak, 2001) and increasing the functioning of the immune system by decreasing cortisol hormone and increasing oxytocin (Blackwell, 2000; Field, 1998). Besides, it stimulates the thalamus to achieve learning, emotion regulation and social interactions (Rice, 1977; Weiss, 1979). For the long term effect on growth and the development of preterm infants, tactile stimulation activates the production of the growth hormone and somatotrophic hormone, increases blood circulation to promote physical growth, and weight gain (Blackwell; Field, 2001; Field, Schanberg, & Scafidi, 1987; Hayes, 1998;

Kuhn et al., 1991; Scafidi & Field, 1990). Tactile stimulation also decreases the duration of the infant in an incubator and promotes early discharge from the hospital helpful for low economic families and enhancing the quality of life of the preterm infants (Maguire et al., 2008; Scafidi & Field). There is much empirical evidence firmly supporting tactile stimulation to be used as cost-effective nursing interventions in promoting growth and development for hospitalized preterm infants (Charoensri, 2002; Liaw, 2000; Sanyod, 2008). However, the implementation of tactile stimulation in clinical practice is still limited (Liaw; Sanyod).

There are several forms of touch that hospitalized preterm infants in Thailand were provided including procedural touch, comforting touch, and tactile stimulation in the form of light stroking and rubbing (Phatthanasiriwethin, 2006). Weerakarn, Sukapan, and Chaisana (2004) conducted a survey study of types, frequency, and duration of touch on premature infants in the NMCU at Songkhla Hospital. They found that 64% of touching was conducted during routine nursing care and only 1.72% of touch was provided for comforting the preterms but did not focus on tactile stimulation as developmental care. This result was correlated with the other studies conducted in Thailand which found that the prevalent type of touch for hospitalized preterm infants was procedural touch, which is not in response in providing care to the infants' behavioral cues and has the potential to cause distress (Indhabhandhu, 2001; Kitchin & Hutchinson 1996).

A Clinical Nursing Practice Guideline (CNPG) is a nursing instrument developed based on the best scientific evidence (Thongchai, 2005). CNPGs have been shown to be capable of improving the quality and consistency of the nursing intervention to achieve better health outcomes (Tilokskulchai, 2006). CNPG's can

describe appropriate nursing care based on the best available scientific evidence and broad professional consensus, and thus decrease the gap between explicit knowledge from research and practice, and also can reduce inappropriate variation in practices (Appraisal of Guidelines Research and Evaluation [AGREE], 2004; Field & Lohr, 1992; National Institute for Health and Clinical Excellence [NICE], 2007).

The NMCU, Songklanagarind Hospital, is one unit of the tertiary health care system to serve newborn patients in 14 southern provinces of Thailand. Nowadays, the NMCU of Songklanagarind Hospital has many CNPG's and nursing standards to control the quality of neonatal nursing care such as a standard for mechanical respirator care, practice guidelines for admission, suctioning, umbilical catheters care, intravenous therapy, central venous catheter care, etc. The CNPG's and the nursing standards which have been used in this NMCU are focused on physical interventions, and are not related to any developmental intervention for preterm infants. Currently, there are CNPG's for developmental care in for NMCU's available for high risk newborns and preterm infants (Als & McAnulty, 1998; Vandenberg, 2007), and low birth weight infants (Phatthanasiriwethin, 2006). These CNPG's focus on the management of light, sound, clustering care, swaddling, parental touch, pain reduction, positioning, and family-centered care. However, those CNPG's are not appropriate to be used in the NMCU of Songklanagarind Hospital because there are significant differences in the contexts of the workplaces such as in the routine nursing care provided, equipment found in work place, attitudes of the nurses, and characteristics of the preterm infants.

The NMCU, Songklanagarind Hospital has identified a 5 year strategic plan to promote developmental care for preterm infants in the setting by using effective

CNPG's (NMCU Quality Development Group, 2011). Tactile stimulation also has been put into the plan as one intervention of developmental care which needs to be reviewed to further formulate the CNPG. However, proper evidence-based interventions and a CNPG for promoting the developmental care for preterm infants have not been developed which has resulted in the discontinuous and inconsistent practice of tactile stimulation in the NMCU, Songklanagarind Hospital.

The application of appropriate tactile stimulation based on reliable scientific evidence as a part of the developmental care for preterm infants by NMCU nurses should be emphasized (Burns, Cunningham, White-Traut, Silvestri, & Nelson, 1994; Indhabhandhu, 2001). Nowadays, there is significant scientific evidence about tactile stimulation which should be analyzed and synthesized for developing guidelines to enhance the quality of developmental care in the NMCU. Therefore, this study was conducted to develop and evaluate the clinical nursing practice guideline of tactile stimulation (CNPG-TS) for preterm infants applicable for NMCU nurses at Songklanagarind Hospital which is also in support of the organization's policy.

Objectives of the Study

The objectives of this study are as follows:

1. To develop the CNPG-TS for preterm infants in the NMCU.

2. To determine the practicability of the CNPG-TS for preterm infants by nurses in the NMCU.

Research Questions of the Study

This study answers the following questions:

1. What are the components of the CNPG-TS for preterm infants in the NMCU?

2. What is the practicability for nurses in using the CNPG-TS for preterm infants in the NMCU?

2.1 What is the percentage of acceptable practicability for each guideline?

2.2 What are the problems, limitations, and recommendation of using the CNPG-TS for preterm infants in the NMCU?

Conceptual Framework of the Study

The conceptual framework of this study comprises three concepts including 1) the guide of the development CPG of Australian National Health and Medical Research Council (NHMRC, 1998), 2) scientific evidence related to tactile stimulation from previous studies, and 3) the criteria for testing process standards of Mason (Mason, 1994).

First, the guide of the development clinical practice guideline (CPG) of the Australian National Health and Medical Research Council (NHMRC, 1998) was used in this study as an organizing framework for developing the CNPG-TS. The NHMRC's method for developing the CPG has 12 steps: 1) determine the need and scope of the guideline, 2) convene a multidisciplinary panel to oversee the development of the guideline, 3) define the purpose and target audience for the guideline, 4) identify the health outcome, 5) review the scientific evidence, 6) formulate the guideline, 7) formulate a dissemination and implementation strategy, 8) formulate an evaluation and revision strategy, 9) assess the guideline document,

10) conduct consultation with the interested parties, 11) conduct a pilot study following the guideline, and 12) report the guideline development process. In this study, the method of developing and evaluating the CNPG-TS was modified by combining and collapsing some steps of the original method of the NHMRC making them more suitable for the context of the NMCU setting and in concert with local physicians, NMCU nurses, and the administration of the workplace. The method for develop the CNPG-TS was modified to seven steps and categorized into two phases.

Secondly, scientific evidence related to tactile stimulation from previous studies was used to guide the scope of the contents for the CNPG-TS. Accessible scientific evidence which was reviewed and analyzed for this study covered the concepts of tactile stimulation, appropriate methods of tactile stimulation for hospitalized preterm infants, appropriate environmental management for providing tactile stimulation to preterm infants, and management of the preterm infant's behavioral and physiological responses.

Thirdly, the criteria for testing process standards of Mason (Mason, 1994) were used as a criterion to evaluate the practicability of the CNPG-TS. According to Mason (1994), testing process standards can be partially be applied as a method to test the efficacy of nurses in implementing each activity in the process standards. In other words, this is similar to examining the practicability of nurses in using each statement of the CNPG to provide care for the target population. The practicability of the CNPG-TS was examined and interpreted by counting the actual practice of the nurses for each statement. The standard set was that each statement had to be practicable a minimum of nine times out of ten (equal or more than 90%) in order to accept the validity and practicability of implementation of the statement. If, on the other hand,

less than 90% indication of the statement as practicable, then the statement is obviously not valid. Consequently, the researcher then needed to readjust or improve the statement by reviewing more evidence or consulting with experts, then conduct more evaluations or add additional interventions (Mason, 1994).

The modified method to develop and evaluate the CNPG-TS in this study was compared with the original method and is shown in Figure 1.

NHMRC method	Modified method
1. Determining the need and scope of guideline	*Phase 1: CNPG-TS development* 1. Determining the need and scope of a CNPG-TS on developmental care for preterm infants in NMCU
2. Convening a multidisciplinary panel to oversee the development of the guideline 3. Defining the purpose and target audience for the guideline 4. Identifying health outcome	2. Convening guideline developing panels to define the purpose, target audience, and outcomes of the developed CNPG-TS
5. Reviewing the scientific evidence	3. Reviewing and analyzing the scientific evidences related to tactile stimulation from previous studies
6. Formulating the guideline 7. Formulating a dissemination and implementation strategy 8. Formulating an evaluation and revision strategy	4. Formulating the evidence-based CNPG-TS and develop the instruments for evaluating the outcomes of implementation of the CNPG-TS
9. Assessing the guideline document 10. Conducting consultation by the interested parties	5. Assessing the CNPG-TS by experts and panels.
11. Conducting a pilot study follow the guideline	*Phase 2: CNPG-TS evaluation* 6. Disseminating the CNPG-TS in routine nursing care at the NMCU 7. Evaluated the practicability of the CNPG-TS by using the criteria for testing process
12. Reporting the guideline development process	standard of Mason (Mason, 1994) The guideline development process was reported after finish analyze the data

Figure 1 Comparison of the steps of developing the CNPG between the NHMRC method and the modified method in this study

Definition of Terms

Clinical nursing practice guideline of tactile stimulation (CNPG-TS) for preterm infants in the NMCU is defined as systematically developed statements as a guide to assist NMCU nurses to provide an appropriate tactile stimulation for preterm infants when being admitted into an NMCU. There were five guidelines, five sub-guidelines, and ninety-five statements developed. Guideline 1 The criteria to select preterm infants in order to provide appropriate tactile stimulation techniques consisted of five statements. Guideline 2 Appropriate environmental management in order to provide tactile stimulation to preterm infants consisted of three sub-guidelines (sub-guideline 2.1 sound management fifteen statements, sub-guideline 2.2 light management three statements, and sub-guideline 2.3 temperature control eighteen statements). Guideline 3 Evaluating preterm infants' readiness and management before receiving tactile stimulation consisted of seven statements. Guideline 4 Evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile stimulation and management consisted of six statements. Guideline 5 Methods of tactile stimulation consisted of two sub-guidelines (sub-guideline 5.1 Method of Gentle Human Touch (GHT) seventeen statements, and sub-guideline 5.2 Method of Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV), twenty-four statements). This guideline was developed based on the modified framework of the CPG development of the NHMRC (NHMRC, 1998) and accessible scientific evidence related to tactile stimulation from previous studies.

Nurses' practicability of using the clinical nursing practice guideline of tactile stimulation (CNPG-TS) for preterm infant in the NMCU is defined as the frequency or percentage of the NMCU nurses' practice of each statement of the CNPG-TS which was assessed by the nurse's practicability questionnaire. The nurse's practicability questionnaire was developed by the researcher. At least 90% agreement in practicability was considered acceptable for each guideline statement (Mason, 1994). Moreover, the practicability of the CNPG-TS was assessed by open-ended questions regarding problems, limitations, and recommendations of using the CNPG-TS.

Scope of the Study

This developmental research was employed to develop and evaluate the CNPG-TS for preterm infants admitted at the Neonatal Moderate Care Unit (NMCU), Songklanagarind Hospital.

Significance of the Study

This study aims to develop the CNPG-TS for nurses. By using the CNPG-TS, NMCU nurses can better make decisions and control the quality of providing developmental care through effective tactile stimulation to preterm infants. The quality of nursing care can be enhanced by improving, maintaining, and facilitating the developmental outcomes of preterm infants resulting in improving the quality of life of preterm infants in the NMCU.

CHAPTER 2

LITERATURE REVIEW

This study was the development and evaluation of the clinical nursing practice guideline of tactile stimulation (CNPG-TS) for preterm infants in the Neonatal Moderate Care Unit (NMCU). This chapter was a review of the literatures relevant to the study. Related information was grouped and presented as follows:

1. Preterm infants in the neonatal moderate care unit and impacts on development
    1.1 Definition of preterm infant
    1.2 Categories of preterm infants
    1.3 Characteristics of preterm infant
    1.4 Impacts of prematurity
    1.5 Impacts of the neonatal moderate care unit environment on preterm infant development
2. Tactile stimulation for preterm infant
    2.1 Definitions of tactile stimulation
    2.2 Concept of providing tactile stimulation for preterm infant
    2.3 Benefits of tactile stimulation
    2.4 Types of tactile stimulation
    2.5 Nursing care related to tactile stimulation
3. Clinical nursing practice guideline development and evaluation
    3.1 Definitions of clinical nursing practice guideline

3.2 Development of clinical nursing practice guideline

3.3 Evaluation of clinical nursing practice guideline

4. Conclusion of the literature review

Preterm infants in the neonatal moderate care unit and impact on development

Definition of preterm infant

"Preterm infant" or "premature baby" is an infant who born before 37 weeks or 259th day of gestation period. (Lutes, Graves, & Jorgensen, 2004).

Categories of preterm infant

According to an approach of nursing care for preterm infants, preterm infants were categorized into three groups as follow (Garner & Goldson, 2006; Srisuparp, 2002).

1. Extreme preterm infants: They are at gestational age of 24-30 weeks, with birth weights of about 500-1,500 grams, and prevalent among 0.8-1.0 % of live newborns. In this group of infants, the growth and physical development has not yet been completed; especially the infants who are at gestational age, less than 27 weeks. The mortality rate is high and special care and treatment is needed. In cases of the infants who survive, complications relating to brain and neurological development usually occur.

2. Moderately preterm infants: They are at gestational age of 31-36 weeks, with birth weights of about 1,500-2,500 grams, and prevalent among 6-7 % of live newborns. Nowadays, the infants in this group (gestational age at 35-36 weeks) may have body weight up to 2,500 grams. In this group of infants, the growth

and physical development also has not yet been completed. With effective treatments and medical equipment it is possible to successfully cure them thus reducing the mortality rate, especially during 1-2 months after birth.

3. Borderline or slightly preterm infant: They are at a gestational age of 36-37 weeks, with birth weights close to 2,500 grams or more, and prevalent among 16 % of live newborns. The preterm infants in this group have characteristic quite similar to full-term infants.

According to the literature reviewed, the preterm infant at lower gestational age has more complications, more incomplete of growth, development, and organ dysfunction which result in a higher mortality rate.

Characteristics of preterm infant

Characteristics of each preterm infant may differ depend on their length of gestation and age or gestational age. Head circumference of them is larger than chest circumference about 2-3 centimeters. Their skin is transparent and delicate. It may appear red or purple. Edema can be seen around eyes, face, legs, dorsa of hands, feet, and scrotum or labia. Lanugo hairs are over body and face. Pinna is flexible due to minimal cartilage. There is flat areola or stippled areola breast bud. Scrotum is visible but the testes may not be descended. Labia has not fully developed, common to mainly see the clitoris. There is no crease or 1/3 anterior transverse crease of plantar surface. Arms and legs may remain in an outstretched position from the lack of muscle tone, and may appear to have jerky movements. Elbows may be easily brought across the chest with little or no resistance. Heel is

easily brought to the ear with little or no resistance. (Askin & Wilson, 2007; Teerarungsikul, 2002; Wheeler & Wilson, 2007).

Impacts of prematurity

There are a number of abnormalities that are more likely in preterm infants than full term infants due to their prematurity. These impacts are as follows.

1. Respiratory distress syndrome (RDS): About 23,000 babies a year (most of who were born before the 34th week of pregnancy) suffer from this breathing problem. The preterm infant with RDS lacks a protein called surfactant that keeps small air sacs in the lungs from collapsing. Treatment with surfactant helps affected babies breathe more easily. Since treatment with surfactant was introduced in 1990, deaths from RDS have been reduced by about half. They may need the support of a ventilator or they may receive treatment called continuous positive airway pressure (CPAP). CPAP delivers pressurized air to the infant's lungs through small tubes in the infant's nose or through a tube that has been inserted into the windpipe. CPAP helps the infant to breathe, but it does not breathe for them. The sickest babies may need the help of a ventilator to breathe for them while their lungs mature (Askin & Wilson, 2007; Teerarungsikul, 2002).

2. Apnea: The preterm infant sometimes stops breathing for 20 seconds or more. This interruption in breathing is called apnea, and it may be accompanied by a slow heart rate. The preterm infants are constantly monitored for apnea. If the infant stops breathing, a nurse stimulates the infant to start breathing by patting him or touching the soles of his feet (Askin & Wilson, 2007; Beck, Wojdyla, & Say, 2009).

3. Intraventricular hemorrhage (IVH)**:** Bleeding in the brain occurs in some preterm infants. Those at gestational age, less than 32 weeks of pregnancy are at highest risk. Bleeds usually occur in the first 3 days of life and generally are diagnosed with an ultrasound. Most brain bleeds are mild and resolve themselves with no or few lasting problems. More severe bleeds can affect the substance of the brain or cause the fluid-filled structures (ventricles) in the brain to expand rapidly. These severe bleeds can cause pressure on the brain that can lead to brain damage (such as cerebral palsy and learning and behavioral problems). When fluid persists in the ventricles, neurosurgeons may insert a tube into the brain to drain the fluid and reduce the risk of brain damage (Askin & Wilson, 2007; Beck, Wojdyla, & Say, 2009).

4. Patent ductus arteriosus (PDA)**:** PDA is a congenital heart problem which a heart problem in preterm infants. Before birth, a large artery called the ductus arteriosus lets blood bypass the lungs because the fetus gets its oxygen through the placenta. The ductus arteriosus normally closes soon after birth so that blood can travel to the lungs and pick up oxygen. When the ductus arteriosus does not close properly, it can lead to heart failure. PDA can be diagnosed with a specialized form of ultrasound (echocardiography) or other imaging tests. The preterm infants with PDA are treated with a drug that helps close the ductus arteriosus, although surgery may be necessary if the drug does not work (Askin & Wilson, 2007; Garner & Goldson, 2006).

5. Necrotizing enterocolitis (NEC)**:** Some preterm infant develop this potentially dangerous intestinal problem 2 to 3 weeks after birth. It can lead to feeding difficulties, abdominal swelling and other complications. NEC can be

diagnosed with blood tests and imaging tests, such as X-rays. Affected preterm infants are treated with antibiotics and fed intravenously (through a vein) while the intestine heals. In some cases, surgery is necessary to remove damaged sections of the intestine (Askin & Wilson, 2007).

6. Retinopathy of prematurity (ROP)**:** ROP is an abnormal growth of blood vessels in the eye that can lead to vision loss. It occurs mainly in preterm infant with gestational age less than 32 weeks of pregnancy. ROP is diagnosed by an ophthalmologist several weeks after birth. Most cases are mild and heal themselves with little or no vision loss. In more severe cases, the ophthalmologist may treat the abnormal vessels with a laser or with cryotherapy (freezing) to protect the retina and preserve vision (Garner & Goldson, 2006; Teerarungsikul, 2002).

7. Jaundice**:** The preterm infants are more likely than full-term babies to develop jaundice because their livers are too immature to remove a waste product called bilirubin from the blood. The preterm infants with jaundice have a yellowish color to their skin and eyes. Jaundice often is mild and usually is not harmful. However, if the bilirubin level gets too high, it can cause brain damage (Askin & Wilson, 2007; Srisuparp, 2002).

8. Bronchopulmonary dysplasia or BPD)**:** Chronic lung disease most commonly affects the preterm infants who require ongoing treatment with supplemental oxygen. The risk of BPD is increased in an infant who still need oxygen when they reach 36 weeks after conception. These infant develop fluid in the lungs, scarring and lung damage, which can be seen on an X-ray. Affected infants are treated with oxygen and medications that make breathing easier. Sometimes they require support from a ventilator and are weaned slowly from the device. Their lungs

usually improve over the first 2 years of life (Askin & Wilson, 2007; Garner & Goldson, 2006).

9. Infections: The preterm infants have immature immune systems that are inefficient at fighting off bacteria, viruses and other organisms that can cause infection. Serious infections commonly seen in preterm infants include pneumonia (lung infection), sepsis (blood infection) and meningitis (infection of the membranes surrounding the brain and spinal cord). The preterm infants can contract these infections at birth from their mother, or they may become infected after birth. Infections are treated with antibiotics or antiviral drugs (Askin & Wilson, 2007; Garner & Goldson, 2006).

The impacts of prematurity and instability organ functions of preterm infants make them unable to live an independent life and they are dependent on the technological equipments and advanced medical care in the neonatal intensive care unit to support them until they can sustain life independently (Als & McAnulty, 1998; Harrison, Lotas, & Jorgensen, 2004).

Impacts of the neonatal moderate care unit environment on preterm infant development

Nursing and medical management of preterm infants in NMCU is often the source of excessive stimulation at a time when preterm infants need to promote neurobehavioral organization. Environmental conditions affect the infant's physiologic status (Bennett, 2002; Aylward, 2005). The preterm infants often respond to changes in the environment and to care-giving interventions with behavioral and physiological changes (Gottfried & Gaiter, 2003; Santman-Wiener,

Long, DeGangi, & Battaile, 1996). Sources of stress in the NMCU include medical and surgical procedures, pain, pathological processes, nursing care interventions and the physical environment, especially sound and light (Long, Lucey, & Phillips, 2001). A preterm infant's stresses lead to energy expenditure, which may alter healing, and recovery processes and growth. Stresses also alter physiological processes and central nervous system organization influencing developmental outcome (McLennan, Gilles, & Neff, 2001). There are two main types of NMCU environment those impact on preterm infants' development including 1) inanimate environment, and 2) animate environment.

1. Inanimate environment (physical environment)

1.1 Sound

According to literature reviewed, there are three concerns that have been identified relating to the effect of the NMCU sound environment on preterm infants including: 1) High intensity sound may cause damage to the cilia of the cochlea leading to hearing loss and stimulate the preterm infant leading to crying state, 2) repeated arousal of the infant to sounds in the NMCU may deplete the infant's physiological resource and energy reserves, interfere with preterm infant's state of consciousness, lead to fatigue, and irritability, and 3) NMCU noise may interact with ototoxic drugs such as the aminoglycosides and have an additive effect on susceptibility to hearing loss. (Blackburn, 1998)

There are two patterns of noises in the NMCU, continuous or background noise and superimposed on these background noises are a high pitch noises. Ambient sound level in the NMCU have been reported to range from 50 to 98 dB, with the high pitch noises up to 120 or more dB (Blackburn, 1998).

Noise levels penetrate and have been shown to interfere with states of consciousness, lead to vasoconstriction, agitation, crying, and stress behavioral responses (Browne, 2000; Minde, 2005), cause fatigue, irritability (Aylward, 2005; Vohr, Wright, Dusick, & Steichen, 2000), increase heart, intracranial pressure (Gottfried & Gaiter, 2003), and decrease oxygenation (Long, Lucey, & Phillips, 2001). High background noise may interfere with preterm infant's ability to discriminate speech, and important early steps in language acquisition. Most of the noise came from procedures performed and routine communication by nursing staffs (Garner & Goldson, 2006).

1.2 Light

NMCU lighting also has a potentially arousing effect on CNS of NMCU infants. Because preterm infants are unable to regulate incoming stimuli, they can easily become over stimulated by even minimal levels of light. Their response can be expressed physiologically by decreased oxygen saturation, increased heart rate, increased respiratory rate, lost calories, increased incidence of retinopathy of prematurely (ROP) or increased intracranial pressure, all of which are linked to alterations in developmental outcome (Vandenberg, 2007). The study of Blackburn and Patteson (1991), stated that the effects of using dim light and cycled lighting has positive effects such as reduced heart rate of the infant during receiving nursing procedures, improved state organization, greater weight gain, and improved clinical status (Blackburn & Patteson, 1991). Studies to date have reported that preterm infants who experience in receiving light management for some portion of the NMCU day shifts demonstrate reduced heart rate, decreased activity, enhanced biologic rhythms, increased sleep (Rick, 2006), decreased behaviors that leading to

crying state, promote habituation, promote readiness of communicating to environmental stimuli (Browne, 2000; Holditch-Davis, Blackburn, & Vandenberg, 2003) and increased infant stability and energy conservation (Fielder & Moseley, 2000). However, these studies also presented the current state of the science in NMCU lighting and demonstrate that appropriate and safe lighting levels in the NMCU have not been practically established.

2. Animate environment (procedural touch/ handling)

For preterm infants, the major caregiver is usually the nurse in the NMCU. For any infant, the caregivers, whether parents, nurse, or other individuals, have major influences on the amount and variety of sensory input the infant receives.

The majority of care giving experienced by infants in the NMCU involves medical or other care giving interventions associated with high levels of sensory input. In comparison with healthy full term infant, these preterm infants experience less speech directed toward them, spend more time alone and are more often asleep during "social" interactions. Most studies have reported that, on average, preterm infants in intensive or intermediate care units are handled for anywhere from 11 to 23 percent of the 24 hour-day (Blackburn & Vandenberg, 1993).

Touch is a far more common phenomenon than social interaction (Indhabhandhu, 2001). Physical and procedural touches are the environmental stressor of preterm infants, whereas tactile stimulation and gentle touch are effective interventions to promote the preterm infant's development (Lutes, Graves, & Jorgensen, 2004). Liaw (2000) indicated that any procedural and inappropriate touch of critically ill or preterm infants has the potential cause distress.

These negative physiological responses from inappropriate touch are reported to include apnea, a significant decrease in transcutaneous oxygen saturation level, and significant increase in respiratory rate, heart rate, and intracranial pressure. Frequent procedural handling also disturbs sleep, leading to reduce weight gain and state regulation (Field, 1998; Harrison, Williams, Berbaum, Stem, & Leeper, 2000). Investigation by Gorski, Huntington, and Lewkowicz (1996) examined the frequency, duration, and magnitude of hypoxemic episodes in preterm infants and identified the activities associated with great decreases in oxygenation. Results indicated that care giving was performed for a mean of 24% of the observation period (range 6-26 minutes per hour). The activities most frequently recorded were suctioning, repositioning and sampling for blood gas analysis, and were associated with the greatest decreases in transcutaneous partial pressure of oxygen (PaO2) (Gorski, Huntington, & Lewkowicz, 1996). Otherwise, the developmental touch such as tactile stimulation and gentle touch were also examined for their immediate effects. Results indicated that they are consolation techniques for preterm infants to relax body, promote a feeling of security to restore a state of well-being, promote quite sleep, and reduce behavioral distress (Field, 1998; Harrison, Williams, Berbaum, Stem, & Leeper, 2000). But the implementation of developmental touch in the clinical practice in NMCU is still limited (Liaw, 2000; Sanyod, 2008).

The NMCU environment including inappropriate level of noises, brighten light, and over controlled procedural touch have excessively impacted on growth and development of preterm infants. However, these harmful environments could be controlled and reduced by continuous providing developmental care to

preterm infants who are admitted to NMCU (Urharmnuay, Blackburn, Chotibang, & Woragidpoonpol, 2004).

Tactile stimulation for preterm infant

Tactile stimulation is one of early stimulating experiences especially on newborn and preterm infant which can determine the extent of possible tactile sensitivity. Montagu (1986 as cited in Field, 2003) explained that tactile sensory is the one of the first senses to develop in the fetus, emerging at about 7.5 weeks gestational age. In the womb, the fetus is constantly stimulated by the amniotic fluid and the increasing pressure from its body on the uterus. During labor, the infant receives massive cutaneous from the uterus, which signals the life sustaining bodily system to begin operating, and to do so properly (Field, 2003). After birth, throughout life, being touched is significant in maintaining physical and mental health (Field, Schanberg, & Scafidi, 1987).

Tactile stimulation is identified as one intervention of developmental care for preterm infant in NMCU based on the concept of intervention to reduce sensory deprivation (Field, 2003). The tactile stimulation in form of gentle touch, parental touch, stroking, and infant massage are appropriate types which likely to enhance many aspects of brain and mental development (Browne, 2000; Churchill, 2000; Debra, Diane, & Michael, 2001).

Definitions of tactile stimulation

Many researchers have conducted the studies about tactile stimulation and determine different definitions of “tactile stimulation”. In the past the study

about tactile stimulation mostly had been conducted as the acting of touch that is interaction by mother or parents with their infant. Fenichl (1945) gave definition that tactile stimulation is the first communication between infant and mother, which make an infant begins to feel affection and love and to express his feeling to her (Fenichl, 1945 cited in Barnett, 1972). Then Barnett (1972) gave the definition of tactile stimulation as a way of conveying meaning that has been used since the beginning of mankind. It is used between parent and child, between lovers, and between friends to convey love, kindness, empathy, and a multitude of meanings (Barnett, 1972).

Afterwards, there are many intervention studies about effects of tactile stimulation. The researchers gave definitions of tactile stimulation as a gentle, light, and systematic skin-to-skin therapy that are cephalocaudal in nature (Oehler, 1985 cited in Blackwell, 2000).

There is also having definition of tactile stimulation as an intervention that gives benefits to infant and their parents. Trevathan (1987) gave definition of tactile stimulation as the mother-infant contact provided around the time of birth appeared to be associated with the activation of hormones that regulate the immune system and stimulate physical growth (Trevathan, 1987 cited in Blackwell, 2000).

Harrison and Wood (1991) identified tactile stimulation as an intervention which is important mediator in the development of parent-infant attachment and in the general well-being of the infant (Harrison & Woods, 1991).

Field (1994) gave the definition of tactile stimulation as the intervention which is significant for physical growth, health and neurological development (Field, 1994). Diamon (1998) also gave definition that tactile

stimulation is one kind of animate environmental stimulation, which is related to myelinization of neurons and frolifration of nerve cell connections or dendritic branching (Diamon, 1998 cited in Blackwell, 2000).

There is definition of tactile stimulation in the Mosby's Dictionary of Complementary and Alternative Medicine, tactile stimulation is the act or fact of touching or being touched; a light stroke or tap; the sense by which pressure or traction on the skin or mucous membrane is perceived (Jonas, 2004).

In conclusion, the definition of tactile stimulation in this study is defined as systemic skin-to-skin therapy which is the act of gentle, light stroking, and gentle touch which significant for early physical growth, neurological and psychological development of human.

Concept of providing tactile stimulation for preterm infant

Concept of providing tactile stimulation for preterm infant is described as the components of tactile stimulation as they relate to facilitating adaptation or fostering maladaptation, which is determined by the varying afferent impressions on an individual's skin (Weiss, 1979). The component of tactile stimulation is involved with six parts including 1) duration, 2) location, 3) action, 4) intensity, 5) frequency, and 6) sensation (Field, Diego, & Hernandez-Reif, 2006; Jay, 1982). The details of each part are described as follow.

1. Duration of tactile stimulation refers to length of time in tactile from initiation of the contact to cessation. Preterm infants may not tolerate a long duration of touching. The length of duration should depend on the infant's response, signals, and the developmental maturity.

2. Location of tactile stimulation refers to the area of the body contacted by the person who is providing tactile stimulation and encompassed three dimensions as follow:

2.1 Threshold is an individual's sensitivity to tactile stimulate. The thresholds of different body areas function to report contact with an external stimuli to different degrees, with regions of maximal sensitivity to stimulate resulting from specialization of the nervous pathway structure in different areas. Body areas that have the most cerebral representation are richly invested with afferent sensory fibers that cause high sensory acuity and fine discrimination. For preterm infants, face is heavily innervated and thus is extremely sensitive, but the back and arms are less sensitive.

2.2 Extent is the number of areas of one's body, which are touched in relation to the number of areas available to be stimulated over the entire body surface. An individual who receives body contact from others over most body areas, in contrast to only a few areas, generally feels greater attraction, to other persons and possesses an accurate perception of the form and shape of the body.

2.3 Centripetality is the degree to which the trunk of the body is tactile stimulated rather than limbs. The trunk of the body represents the core of the person, that aspect of the body where primary perception of self is concentrated.

3. Action of tactile stimulation refers to the rate of approach to a body surface with the attendant amount of physical energy. Action can be abrupt or gradual as a function of speed or rate of approach to the body. In practice, preterm infants usually need gradual and rhythmic action of tactile stimulation.

4. Intensity of tactile stimulation refers to the extent of indentation applied to the body surface by the pressure of tactile stimulate. Different degree of intensity of tactile stimulation can result in different states of hyperexcitability in the cortex. Rice (1977) recommended preliminary light tactile stimulation of preterm infants in the area of the body where a procedure would be performed (Rice, 1977).

5. Frequency of tactile stimulation refers to the overall amount of tactile stimulation which an individual experiences. Frequency of tactile stimulation affects the metabolism; intestinal motility; and gradular, biochemical, and muscular changes. High frequency of tactile stimulation promotes the positive value for linking of self, awareness of one's body, a sense of closeness with others, increased cognitive and emotional development.

6. Sensation of tactile stimulation refers to the immediate comfort or discomfort reaction of the skin to a tactile stimulation, with specialized reception and transmission to the brain. Painful tactile stimuli or discomfort sensation distort the body image by preventing adequate functional of the body's perceptual system, while pleasurable tactile interaction allows for maximal discrimination, providing vital information for development of a positive and stable of one's body as a worthwhile and valuable part of the self.

In conclusion, the perception and response of preterm infants to tactile stimulation is based on the ability of the skin sensation and central nervous system of each the individual. The component of tactile stimulation includes 6 parts: are duration, location, action, intensity, frequency, and sensation. They must be considered through all stages of tactile stimulation for preterm infants to control the

appropriateness of the tactile intervention for each preterm infant who has different perception and response.

Benefits of tactile stimulation

Sleep-wake pattern

Preterm infants who receive tactile stimulation appear more alert and spend less time in active sleep state (Solkoff, & Matuszak, 2001). In a study by Kelmanson and Adulas (2006) found that preterm infants at less than 36 weeks of gestation (birth weight less than 2.5 kg) who had received tactile stimulation until 8 months of age, had improved quality of quiet sleep, with less awakening during sleep, less drowsy when awake, and were more active during the day.

Infant behavior

Preterm infants who received tactile/kinesthetic stimulation had better scores of the Brazelton behavior assessment scale (Brazelton, 1984) in terms of state orientation, regulation of state, and autonomicstability (Mathai, Fernandaz, Mondkar, & Kanbur, 2001). Preterm infants who received gentle human touch improved scores on mature habituation, orientation, motor, and range of state behavior were observed in another study (Harrison, Williams, Berbaum, Stem, & Leeper, 2000). Preterm infants (mean gestational age 30 weeks) who received moderate pressure therapy (5 days) were less fussy, cried less and showed less stress behavior (Field, Diego, & Hernandez-Reif, 2006). Moreover, parental tactile stimulation also found to improve the mother infant interaction and thus enhances their bonding (Lee, 2006).

Weight gain

Weight gain is the most consistent parameter associated with tactile stimulation in preterm infants. In a study of Scafidi and Field (1990), forty preterm infants (mean gestational age 30 weeks; mean birthweight 1.17 kg) were subjected for tactile/ kinesthetic stimulation of 45 minutes per day (three sessions of 15 minutes each) for 10 days. It was observed that infants who received tactile/ kinesthetic stimulation had 21% greater weight gain (28 to 34 g). Similar results (weight gain of 21.9%; 4.24g/day) were also observed by Mathai, Fernandaz, Mondkar, and Kanbur (2001). Most of the studies have enrolled medically stable infants at more than 30 weeks of gestation. The effect of tactile/ kinesthetic stimulation on weight gain in preterm infants less than 30 weeks has not been found.

Local effects on skin

Oil massage results in improved thermoregulation by decrease in the convection losses through skin. In a study in Nepal, the incidence of early hypothermia in the first 2 hours after delivery was reduced by nearly 50% and the incidence of late hypothermia in the first 24 hours after birth was reduced by 30% by implementing one of three interventions after delivery (kangaroo care, traditional mustard oil massage under a radiant warmer, or plastic swaddling (Johanson, Spencer, Rolfe, Jones, & Malla, 1992). Greater increase in temperature has been noted in preterm infants who receive tactile/kinesthetic stimulation (Diego, Field, & Hernadaz-Reif, 2005). And tactile stimulation has been shown to improve the skin barrier function (Darmstadt & Dinulos, 2000).

Types of tactile stimulation

According to the relevant evidences related to the concept and existing intervention studies of tactile stimulation for preterm infant, five forms of tactile stimulation have been found. The types of tactile stimulation are categorized into 1) tactile/kinesthetic stimulation, 2) multi sensory stimulation, 3) multi-modalities sensory stimulation, 4) gentle human touch (GHT), and 5) baby massage. The five forms of tactile stimulation are described as follow:

1) Tactile/Kinesthetic stimulation

Field, Diego, and Hernandez-Reif (2006) have conducted several experimental studies to invent an appropriate program of tactile/kinesthetic stimulation which does not have an affect negative autonomic and behavioral response of medically stable preterm infants in NMCU. Their studies found that the most appropriate tactile/kinesthetic stimulation should be divided into three phases, each lasting five minutes (Field, Diego, & Hernandez-Reif, 2006).

Phase 1: Tactile stimulation is used by stroking infants in prone position. Infants are stroked at five areas, lasting one minute each. Within one minute, infants should be stroked twelve times, each lasting five seconds. These five areas are 1) from top of head down to neck, 2) from neck crossing over to shoulders, 3) from top of back to hips, 4) from thighs to alternate feet and back to thighs, and 5) from shoulders to alternate hands and back to shoulders.

Phase 2: Kinesthetic stimulation is used by stroking five organs of infants lying in a supine position, each lasting one minute. In one minute, there should be six rounds of bending and stretching, each lasting ten seconds. The stimulated organs are alternate arms, alternate legs, and both legs simultaneously.

Phase 3: Phase one is repeated.

The tactile/kinesthetic stimulation takes five consecutive days, two times a day, and each lasting fifteen minutes. This can be done when the infants' body weight is between 550-1,800 grams (Field, Schanberg, & Scafidi, 1987; Field, 1988). However, at present, the study showed that the most appropriate body weight for the tactile/kinesthetic stimulation is more than 1,500 grams (Field, Diego, & Hernandez-Reif, 2006). The appropriate gestational age of infants to start the stimulation is more than 32 weeks with postnatal age more than 6 days. However, the infants must not have congenital heart malformations, abnormality of the digestive tract, abnormality of the central nervous system, hereditary abnormalities, or maternal substance abuse. Moreover, their condition has to be stable and have not received prolonged supplemental oxygen, intravenous fluids (Field, Diego, & Hernandez-Reif, 2006; Mathai, Fernadez, Mondkar, & Kanbur, 2001).

2) Multi sensory stimulation

The multi sensory stimulation was initially developed by Ruth Dianne Rice in 1976 as Rice Infant Sensorimotor Stimulation (R.I.S.S.) program which more focus on tactile and vestibular stimulation (White-Traut & Goldman, 1988). Afterward, White-Traut, Nelson, and Silvestri (1997) have conducted several experimental studies to adapt the appropriate and feasible program of multi sensory stimulation for stable and unstable preterm infants. Their studies found that the most appropriate and feasible program which could reduce stress reactivity and promote consistent behavior during and after implementation, should consist of auditory, tactile, visual, and vestibular stimulation (White-Traut, Nelson, & Silvestri, 1997).

The program has been proposed as multisensory stimulation: auditory, tactile, visual, and vesibular stimulation (ATVV).

The ATVV includes 4 types of stimulation which are 1) soft talking (auditory), 2) tactile and kinesthetic stimulation (tactile), 3) eye to eye contract (visual), and 4) rocking (vestibular). The activity begins with soft talking, then light massage, and followed by rocking (White-Traut, Nelson, & Silvestri, 1997). During the activity, researchers talk or sing to infants while maintaining eye contact. The activity lasts five consecutive days, once a day after the morning feeding. Each session lasts fifteen minutes, with ten minutes of tactile stimulation and five minutes of rocking. The method for providing ATVV stimulation was described in the following steps (White-Traut, 2006):

Step 1: Begin by talking to an infant for at least thirty seconds or until infant is no longer sound asleep. While talking, pause often so the infants can response back to provider. Try to maintain eye contact if the infant's eyes are wide open.

Step 2: Put a folded blanket on lap then place the infant on the blanket. Then, remove the infant's clothes except for the diaper and cover the infant with receiving blankets or towels. Expose only the part that will massage.

Step 3: Massage the infant for ten minutes. Use a light touch with fingertips. Talk slowly to the infant in a calm, soothing voice while providing massage and try to maintain eye to eye contact if the infant's eyes are open. For light massage procedures are described as follow:

1) Massage the infant's head with entire hand from forehead to neck to back of neck about ten times.

2) Start massaging face by using two fingers, lightly stroke across the infant's forehead about three times. Then lightly stroke cheeks from upper nose to under ears about three times. Finally, lightly circle around the eyes about three times.

3) Lightly stroke the neck under the chin about three times.

4) Put the infant in prone position, massage the infant's back using long strokes from shoulders to diaper area about three times. Then turn the infant to lie on the side and face to provider. Using only first two finger-pads in a small circular motion to massage the back again from shoulder to diaper area about three times. Try to maintain eye to eye contact while supporting the infant's head by another hand.

5) Turn the infant in supine position, and remove diaper. Then, massage the infant's chest and tummy with long smooth strokes from shoulder to diaper area about three times.

6) Massage tummy lightly using a large circular motion about three times.

7) Massage each of the infant's arm using long strokes from shoulder to wrist about three times. One arm at a time.

8) Massage each of the infant's legs using long strokes from hip to ankle about three times. One leg at a time.

Step 4: After the 10 minutes of massage, swaddle the infant with the towel, hold and slowly rock the infant for 5 minutes in either an up and down movement or in a side to side movement. Maintain eye to eye contact and talk softly to the infant.

Step 5: Place the infant back to crib.

Apart from hospitalized preterm infants, multi sensory stimulation can be used with infants who stay at home (Rice, 1977). While in hospital, the ATVV stimulation takes five consecutive days, two times a day, and each lasting fifteen minutes. The stimulation should be provided 30 minutes before a feeding to help the infant to more alert to be ready for feeding (White-Traut, 2006). The ATVV could be done when the infants' body weight is 1,400 grams or more (White-Traut, 2006; White-Traut et al., 2002). The appropriate gestational age of infants to start the stimulation is more than 28 weeks with postnatal age more than 48 hours (White-Traut, 2006). The preterm infants who are going to receive ATVV should be clinically stable with must not during oxygen therapy, no clinical signs of congenital heart malformations, severe birth asphyxia, neonatal seizure, severe sepsis, bronchopulmonary disease, intraventricular hemorrhage, neonatal hyperbilirubinemia with phototherapy or exchange blood transfusion (White-Traut et al., 2002).

3) Multi-modalities sensory stimulation

This is an application of the multi sensory stimulation of White-Traut, Nelson, and Silvestri (1997) and tactile/kinesthetic massage of Field (1988). Multi modalities sensory stimulation is divided into five phases as follows:

Phase 1: Playing classical music to infants for ten minutes (continuing to Phase 2)

Phase 2: Gently stroking infants in prone position in five areas, one minute each. In one minute, infants should be stroked 12 times, each lasting five seconds. The five areas involved are head to neck, neck to waist, shoulders to

fingertips on both hands, and thighs to tip of toes on both feet. Then, infants are put in the supine position, and they are stroked form their forehead down to both ears.

Phase 3: Stimulating movement when infants are in the prone position. Slowly bending and stretching their limbs in five parts, each lasting one minute. In 1 minute, the bending and stretching should be done 12 times, each lasting five seconds. This includes bending and stretching right arm, bending and stretching left arm, bending and stretching right leg, bending and stretching left leg, and bending and stretching both legs. After that, the music should be turned off.

Phase 4: Stimulating sight of infant by turning infant to face the provider who is talking and maintaining eye contact for 1 minute.

Phase 5: Repeating Phase 2.

This type of tactile stimulation is done twice a day, for 16 minutes. Each should be continued for ten days (Tinikul, 2000; Charoensri, 2002; Penjing, 2006). Multi modalities sensory stimulation can be used with infants whose weight ranges from 1,400 to 2,000 grams (Chareonsri, 2002). However, Penjing, (2006) found that it can also be used with infants who weigh 1,400 to 1,700 grams. The appropriate age range is 32 to 36 weeks. It can be used with infants who are clinically stable and have no oxygen therapy, congenital abnormalities, serious infections, and abnormal digestive system.

Charoensri (2002) and Penjing (2006) conducted the quasi-experimental study, their findings have indicated that multi modalities sensory stimulation could increase body weight of infants than that of infants in the control group (Charoensri, 2002; Penjing, 2006), and their overall development is also higher than that of the control group, especially social interaction, motor system,

state organization, stage regulation, autonomic system, and supplementary items (Tinikul, 2000). In addition, their period of sleep also longer than that of the control infants, and their maternal- infants attachment is also higher (Charoensri, 2002).

4) Gentle Human Touch (GHT)

The Gentle Human Touch (GHT) is one type of tactile stimulation which would stimulate tactile and pressure receptors, thus promoting infant comfort and reducing stress (Harrison, 2001). Harrison, Williams, Berbaum, Stem, and Leeper (2000) have conducted two pilot studies to identify the effective method of the GHT which has positive outcomes on soothing and relaxation effects on preterm infants. Their studies found that the provider should place hands softly and calmly on the head and abdomen of infants for fifteen minutes and gradually relax arm muscles every thirty seconds. The position of infant during implementation could be prone, supine, or side lying position (Harrison, Williams, Berbaum, Stem, & Leeper, 2000).

The GHT takes ten consecutive days or until body weight of the preterm infant reaches 2,000 grams, three times a day, and each lasting fifteen minutes (Harrison, Williams, Berbaum, Stem, & Leeper, 2000). The appropriate gestational age of infants to start the GHT is more than 27 weeks with postnatal age more than 48 hours (Harrison, 2001). The preterm infants who going to receive the GHT should be clinical stable, no severe signs of congenital heart malformations, severe birth asphyxia, neonatal seizure, severe sepsis, bronchopulmonary disease, intraventricular hemorrhage, neonatal hyperbilirubinemia with phototherapy or exchange blood transfusion (Harrison, 2001). The preterm infant who has stable and normal oxygen saturation with receiving oxygen flows in incubator or continuous

positive airway pressure via nasal cannula could receive the GHT but need to be monitored oxygen saturation through the implementation (Harrison, Williams, Berbaum, Stem, & Leeper, 2000).

5) Baby massage

Nowadays, they are combining baby massage with other methods such as oil massage, and music. In India, oil is used to massage infants because oil can enhance skin functioning, increase body warmth, and make growth more effective (Charoensri, 2002). Research was conducted with infants younger than 37 weeks of age and weighing less than 1,500 grams using 10 mL/kg/day of sunflower oil in tactile/kinesthetic massage given to infants four times a day, each lasting ten minutes, for then consecutive days. It was found that the body weight of the infants who received massage with oil increased more than that of infants who were massaged with no oil (Arora, Kumar, & Ramji, 2005). After that another study was carried out to compare coconut oil and mineral oil used with infants weighing 1,500 to 2,000 grams for three times day, each lasting 15 minutes, for ten days. The finding revealed that the body weight of infants who were massage with coconut oil increased more than that of those who were massage with mineral oil. At present, music is also used to give massage to preterm infants. Charoensri, (2002) investigated the use of classic music while massaging infants weighing 1,400 to 2,000 grams for 16 minutes twice a day for ten days. According to the study findings the body weight of the experimental infants increased and their development was better than those of the control infants. Besides, the experimental infants had a longer sleep period and a higher level of maternal- infant attachment when compared to the control infants who received no massage (Charoensri, 2002). However, the

studies (Charoensri; Penjing, 2006) indicated that types of baby massage may appropriate to near-term infant, but not for general preterm infants. Their studies reported that, there were also several disengagement behaviors and unstable heart rate and respiratory rate of preterm infants during receiving baby massage combined with music (Charoensri; Penjing). Thus, this type of massage is not be selected for the developed CNPG-TS.

In conclusion, each type of tactile stimulation gives several benefits for growth and development of preterm infants. However, the preterm infant has individual characteristic and clinical condition. Thus, the care caregiver must select the most appropriate type for each infant. According to relevant evidence, there are important criterions which need to be considered prior to selecting an appropriate type of tactile stimulation. These include 1) current body weight, 2) gestational toage, 3) postnatal age, and 4) clinical condition and treatments. However, types of tactile stimulation that were selected to be used in this study were the ATVV and GHT due to their simple, practicable, and secure methods for providing to preterm infants.

Nursing care related to tactile stimulation

According to literature reviewed of the current evidences about tactile stimulation in NMCU, the researcher can group the nursing cares related to tactile stimulation for preterm infants in NMCU into 3 parts. There is 1) environment preparation for providing tactile stimulation for preterm; 2) assessment and management of infant's responses before and during implement stimulation; and 3) appropriate techniques of tactile stimulation for preterm infants.

The environment preparation for providing tactile stimulation for preterm and the assessment and management of infant's responses before and during implement stimulation are described as follows. For the appropriate techniques of tactile stimulation for preterm infants, it has been described above in the topic of "types of tactile stimulation for preterm infants" which described appropriate methods and important selecting criterions of each type.

Environment preparation for providing tactile stimulation for preterm

Optimal physical NMCU environment can reduce stress of preterm infants which is crucial for the best outcome of tactile stimulation on every preterm infant (Field, 2003; Turnage-Carrier, 2004; White-Traut, 2006). According to reviewing of the related evidences, the related-environments which must be considered and managed during tactile stimulation are categorized into 3 parts include sound, light, and stability of environmental temperature as evidences those described below.

1) Light management (Aita & Snider, 2003; Garner & Goldson, 2006)

- Assure darkness for the infant during sleep and maintain dim light during interventions.

- Make sure that all lighting that falls on the infant's face is indirect. Should use cloth-covered on top of the incubator and open only necessary part.

- If the infant is in the incubator among light, should cover the incubator with covered cloth on top of the incubator. And open only one side which the provider is standing.

2) Sound management (Browne, 2000; Garner, & Goldson, 2006)

- Choose a quiet place. No excessive noise from the ventilator or sound alarms from other medical devices. Provider should stimulate and respond to sound alarms of medical equipment as quickly as possible.

- Infant may be in the incubator or in an infant crib. If they are in the infant crib, they should be moved to a private room.

- Maintain calm, quiet, and soothing atmosphere at all time during any activity.

- During implement, the provider should talk to the infant with a soft and gentle tone.

- Set monitor alarm and be concern to stop monitor alarm.

3) Management of stability of environmental temperature (Field, 2003; Jirapaet & Jirapaet, 2002)

- Maintain the temperature in the ward to remain contstant, turn on the air conditioning at all times. Constant temperature, 26-28 degrees Celsius.

- Close the doors and all the windows along with curtains for sun protection in the area for implementing tactile stimulation.

- Must be positioned away from the wall at least 2 feet which is not located in an area that has a natural/air conditioner wind blowing, fan, or sun shine.

- If the infant is in the crib, you could move the infant with crib into a room that has a stable temperature of 26-28 degrees Celsius.

- If the infant is in the incubator, a radiant warmer is needed to replace the infants warmness. The radiant warmer must be used since the infant has to take off clothes at start until the intervention is finished.

- If the infant is in the incubator and using a skin servo control mode, must change to an air control mode before implementing stimulation. After finishing, change mode back to skin servo control and adjust temperature as set previously.

- Warm all equipments that will be use with the infant, including the hands of the provider.

- During implement stimulation, provider must observe signs of cold-stress which are cool extremities, cool skin, decreased peripheral perfusion, irregular breathing, apnea, bradycardia, lethargy

- Follow-up the infant's axillary temperature immediately after finish tactile stimulation. The body temperature should be in the normal parameter which is 36.8 to 37.2 degrees Celsius.

- If the infant has any signs and symptoms of sub-temperature during or after tactile stimulation, the provider must stop intervention immediately, put on clothes, and warm the infant closely. If symptoms have not improved, you must do rapid warming by placing the infant under the radiant warmer with skin servo control mode. Then follow-up the axillary temperature every 30 minutes until the temperature rises to 37 degrees Celsius before put the infant back into the incubator.

In conclusions, the typical NMCU environment can be incompatible with the neurodevelopmental needs of preterm infant. The caregiver needs to

manage environment for preterm infant before start tactile stimulation to promote the perception of the preterm infants. The environment should be reduced for the excessive light and noise, control the stability of environmental temperature, and prepare readiness of tactile stimulation provider.

Assessment and management of infant's responses before and during receiving tactile stimulation

Response of the preterm infants is the signal through physiology and behavior that infants expressed in response to the satisfaction, joy, stress, or pain when receiving all types of sensory stimulation from the environment (Burns, Cunningham, White-Traut, Silvestri, & Nelson, 1994). The responses of the infants who are involved in tactile stimulation, which must be assessed, include 1) the alertness/ states of preterm infants, 2) the behavioral cues of preterm infants, and 3) the physiological responses of preterm infants. The responses of infants need to be assessed before and during tactile stimulation. The infant's alertness/ states and infant's behavioral cues (in part of engagement cues) need to be assessed before start tactile stimulation. And the infant's behavioral cues and infant's physiologic responses are assessed and monitor during tactile stimulation (Harrison, Williams, Berbaum, Stem, & Leeper, 2000; White-Traut, 2006). The details of infant's responses to tactile stimulation are as follows.

1) The alertness/ states of preterm infants

Infants can indicate through their alertness and state availability when touch interaction may be optimal. The infants who received adequate rest prior to receiving tactile stimulation are ready to communicate with people while get

tactile stimulation (Browne, 2000; Shibler & Fay, 1990). Infant's alertness/ states can reflect the underlying functioning of the brain, which related to developmental outcomes of them (Whaley & Wong, 1999). The states also affect the preterm infant's ability to response to stimulation (Whitney & Thoman, 1993 as cited in Holditch-Davis, Scher, Schwartz, & Hudson-Barr, 2004).

There are many criterions to assess the states of preterm infant. But the Sleep-Wake State of Premature Infants measurement which was developed by Parmelee & Stern (1972) is the most appropriate one for assess the state of preterm infant before starting tactile stimulation (Parmelee & Stern, 1972 as cited in Livingston, Beider, Kant, Gallardo, Joseph, & Gold, 2009). This criterion is practical decision based on the fact that the tool has been used over a wide age range, including the fetus and preterm infants (Livingston et al., 2009). This criterion characterized each state of the preterm infant by observing the movement of their eyelids, movement of body, and respiratory pattern (Perinatal Nursing Education, 2010). There are 6 different states and appropriate practice for preterm infant (Kurdrit, 2002; Perinatal Nursing Education; White-Traut, 2006) are described as follow:

1.1) Quiet sleep: This state is important because mechanisms are maturing at all levels of the CNS during infancy. Quiet sleep is characterized by closed eyes with NREM, regular respiration and abdomen movement body movement or startled.

1.2) Active sleep: If external stimuli occur when infants are in this state, they may remain in this state. If the infants are in this state, we can wait for 10 minutes to see whether they return to deep sleep, or become used to

drowsiness. If they become drowsy, we can wake them up by soft touching and talking. This state is characterized by closed eyes with REM, irregular respiration, and limb movements of forearms, legs, hands, feet, head, and body.

1.3) Drowsy: Preterm infants may be unable to engage in eye-to-eye contact with the parents or may be able to sustain it only for a short period of time. If they are drowsy, we can wake them up by soft touching and talking until they become quiet alert. This state is characterized by half-open or closed eyes with REM, irregular respiration, and quiet or some movements of the body.

1.4) Quiet alert: Preterm infants who are in this state are likely to receive more social stimulation and have a slight advantage in cognitive development. They also tend to have a bright alert look with attention focused. This state is characterized by fixed and opened eyes, regular respiration, and slow movement of forearms, legs, hands, feet, or head, or no movement at all.

1.5) Active alert: The infants' activity increases in the active alert state. During this state, the infant may be unable to focus attention and has a decreased tolerance for continuous stimulation. The infants may escalate to crying; we should use a more soft voice, less tactile, and should observe the signs of crying, then they may return to the quiet alert state. This state is characterized by opened eyes, irregular respiration, and movement of forearms, legs, hands, feet, and body, or total body movement.

1.6) Crying: Crying is the first way used by infants to communicate. Infants seem to have some fussy periods when they are difficult to console. This state is characterized by closed or open eyes, irregular respiration, movement of the trunk and body, and strained muscles.

In conclusion, during the quiet-alert state, infants are most attentive to their environment, interacting socially and responding to their caregivers. Periods of alertness provide a way for infants to make contact with their environment and learn about the people around them. Thus, the preterm infant in the state of quiet alert are the most appropriate to start tactile stimulation.

2) The behavioral cues of preterm infants

Infant behavior is influenced by state, temperament and the ability of the infant to self-regulate. Behaviors are often cues, activities that signal an infant's status or needs. The behavioral cues of preterm infant are related with self-regulation (Perinatal Nursing Education, 2010). Self-regulation is the "capacity to adapt to one's surroundings in a healthy and predictable way" (Barnard, 1999 cited in Nursing Education, 2003). Some infants are able to regulate themselves well from birth and are easily readable; others need more time and may require more assistance. Readability is the clarity of cues infants through motor behavior, looking, listening, and behavior patterns during all states (Stratton, 1982 cited in White-Traut & Goldman, 1988). Infants differ in the clarity with which they make known their needs and in the consistency of their state during any stimulation intervention (Browne, 2000).

Infant cues are behaviors that signal an infant's status or needs. Infants provide cues for their caregivers in a variety of ways. Infant state and behavioral abilities are cues. Engagement cues are a type of behavior that signals the infant's readiness to interact with caregivers. Disengagement cues are a type of behavior that signals the infant's need for time-out or a reduction in stimuli (Nursing

Education, 2003). Several engagement or disengagement cues occurring together are more important than an isolated cue (Browne, 2000).

Engagement cues include the eyes becoming wide open and bright as the infant focuses on the caregiver; alert face or an animated face with wide open bright eyes; often accompanied by gently pursed lips as if the infant were saying "ooh"; grasping or holding onto the caregiver or objects in the environment; hand-to-mouth activity; often accompanied by rooting and sucking movements (they may also suck on their fingers); smiling; turning eyes, head, or body toward someone who is talking; and smooth motor movements.

Disengagement cues include crying or fussing; hiccoughing; spitting up or gagging; jittery or jerky movements; frowning or grimacing; becoming red or pale; agitated or thrashing movements; falling asleep; and averting the gaze (the infant moves her eyes or head away from the caregiver) (Nursing Education, 2003; White-Traut, 2006).

Before start tactile stimulation, the engagement cues need to be assessed carefully. If there is any of disengagement cues occur, the tactile stimulation must not start. The caregiver should console the infant by talk to the infant in a steady, soft voice; hold both of the infant's arms close to the body; swaddle the infant; or pick up and rock the infant until become calm (Nursing Education, 2003). During tactile stimulation, the behavioral cues still need to be observed closely. But if any of the disengagement cues occur, the caregiver should console the preterm infant immediately. There are 4 evidences (Hadley & West, 1990; Harrison, 2001; Perinatal Nursing Education, 2010; White-Traut, 2006) those

suggested the effective consolations for preterm infant during tactile stimulation which could be concluded and organized as instruction as follow:

Step 1: Whenever the disengagement cues occur, the caregiver should do slower tactile stimulation and soft talking with the infant for 10-15 seconds.

Step 2: If not better, then stop tactile but still soft talking with the infant for 10-15 seconds.

Step 3: If not better, then stop talking and may need to place pacifier if the infant is crying, wait for 10-15 seconds or until become calm. Then swaddling and snugly hold infant's arms and legs close to their body for 10-15 seconds.

Step 4: But if the infant still presents any disengagement cues, the caregiver may need to stop all interventions, continue swaddling and snugly hold the infant, and the place infant to rest.

In conclusion, the behavioral cues of the preterm infant are the positive and negative signals of the infant responses to interactactions with caregivers. The behavioral cues must be observed before and during tactile stimulation. The engagement cues are a type of behavior that signals the infant's readiness to interact with caregivers. The disengagement cues are a type of behavior that signals the infant's need for time-out or a reduction in stimuli, and to be immediately consoled.

3) The physiological responses of preterm infants

The physiological responses of preterm infants during tactile stimulation need to be concerned to protect the well- being of each infant, especially in clinically stable preterm infants who are capable of exhibiting a broad range of physiological responses (Burns, Cunningham, White-Traut, Silvestri, & Nelson, 1994).

According to several evidences which studied the preterm infant's physiological responses to any types of tactile stimulation, suggested that the important physiological responses which should be monitored are heart rate, respiratory rate/ pattern, and oxygen saturation (Burns, Cunningham, White-Traut, Silvestri, & Nelson, 1994; Harrison, Williams, Berbaum, Stem, & Leeper, 2000; Livingston, Beider, Kant, Gallardo, Joseph, & Gold, 2009; Sanyod, 2008).

Burns, Cunningham, White-Traut, Silvestri, and Nelson (1994) developed the guideline to assess and manage the preterm infant's subtle physiologic change during receiving sensory stimulation. This study has strengthens of the internal validity of the research design which are experimental error was minimized, whereas the variance between experimental and control groups is maximized. Thus, at present, this guideline has been used by many researchers and caregivers to assess the infant's physiological responses during implement any sensory stimulation (Burns, Cunningham, White-Traut, Silvestri, & Nelson, 1994; Harrison, Williams, Berbaum, Stem, & Leeper, 2000; Peters, 1999).

The guideline explained that the preterm infant who receives tactile stimulation needs to be assessed for baseline value and normal range of his/her the heart rate, respiratory rate/ pattern, and oxygen saturation before start intervention.

Then should be monitored by pulse oxymeter machine to assess heart rate and oxygen saturation, the respiratory pattern could be observed by the caregiver.

The normal changes during any sensory stimulation include heart rate is between 100-200/ minute, or change less than 20% of baseline value; respiratory rate not decrease, or not increase more than 20 breaths/minute of baseline value; and oxygen saturation more than 86%. Whereas, the abnormal changes are described as below:

- Heart rate less than 100 or less than 200 /minute, increase more than 20% of baseline value, continuously decrease with SaO_2 less than 88%, or abnormal with disengagement cues occurs.

- Respiratory rate increase more than 20/ minute of baseline value, or decreased with SaO_2 less than 86%, or apnea

- Oxygen saturation less than 86%

The instruction for management when the infant has abnormal physiological response is described as follow:

Step 1: If there is any abnormal physiological responses occur, the caregiver need to stop tactile stimulation for 15 seconds. In case of SaO_2 less than 86% and the infant is on oxygen therapy, increase oxygen until SaO_2 more than 86%. If the infant is not on oxygen therapy, need to stop tactile stimulation for 1 minute until SaO_2 more than 86%.

Step 2: Re-positioning the preterm infant to rest and calm, then assess the three physiological responses.

Step 3: After the three physiological responses and recovery to normal, resume intervention 15 seconds post recover. If any abnormal physiological is still occur, provider need to stop intervention and consult with a resident.

In conclusion, the important physiological responses which need to be assessed include heart rate, respiratory rate, and oxygen saturation. The caregiver must concern to assess and record the baseline values of these responses before starting tactile stimulation. The pulse oxymeter is necessary to use to monitor accurate values during tactile stimulation.

Clinical nursing practice guideline development and evaluation

Clinical nursing practice guidelines are one approach to help health care providers especially nurses to make decisions for appropriate practices in order to improve quality of nursing care (Thongchai, 2005). The clinical nursing practice guidelines come from systematic development and have different levels of evidence (Tilokskulchai, 2006). These guidelines should be guaranteed that the development of them are based on efficient evidence base literatures and passed the trial study, therefore they are acceptable and more disseminated for using in health care practices (National Health and Medical Research Council [NHMRC], 1998).

Definitions of clinical nursing practice guideline

According to literature reviewed, the clinical practice guidelines (CPGs) are usually found and used in health science professions. In medical profession, it is called clinical practice guideline (CPG) and in nursing profession, it is called clinical nursing practice guideline (CNPG) (Tilokskulchai, 2006). They are similarly given

academic meaning of CPG and CNPG as the systematically developed statements that assist members of the health care team and their patients to make appropriate decisions about a specific condition or treatment (Appraisal of Guidelines for Research and Evaluation [AGREE], 2004; NHMRC, 1998; Scottish Intercollegiate Guidelines Network [SIGN], 2008; Sitthi-amorn, Supachutthikul, Ratanalert, & Ratchaboriruk, 2000).

However, the CPG and CNPG may slightly different in some part of basic evidence. The CNPG usually arise following an examination of the current best evidence emphasize on nursing knowledge or practices, combine with ethic and freedom of the nursing profession that appropriate with the context of holistic care (Tilokskulchai, 2006). The CNPG may be in a type of flow chart, table, or algorithm which is the simple format to assist nurses make decisions easier, or in the complex format such as clinical pathway or care map (Banning, 2005).

The contents of effective CNPGs should be based on a systematic reviewed of high levels evidence of nursing practices (Thongchai, 2005). However, the CNPGs are for guidance and they are not standards of care (Bosnjak, 2003). Rather, they are more flexible tools that can be used to help practitioners improve the quality of their clinical decisions and the quality of care by facilitate the appropriate care for patients, and reduce the use of unnecessary and ineffective or harmful interventions (AGREE, 2004; Bosnjak, 2003; NHMRC, 1998). The format of a CNPG is usually determined by the particular aspect of care or condition it addresses and by the target patient population. Sometimes the CNPGs may give a broad objective for care and criteria sets for its achievement. At other times CNPGs may provide greater detail and specificity including more information about the patient's condition and

treatment options (Evidence-based medicine & clinical practice guidelines committee of the royal college of physician of Thailand [RCPT], 2001; National Institute for Health and Clinical Excellence [NICE], 2007).

In conclusion, the CNPG is systematically developed statements to describe appropriate approaches of nursing care to enhance quality of health care system. It can assist the decision making of health care providers and patients for efficient and appropriate practices, reduce inappropriate variation in practice to save time and budget of the organization, and enhance the health care practicing to become more systematic which lead to the best practice on health care service and improve quality of life of the patient.

Development of clinical nursing practice guideline

According to literature reviewed, several studies used the process of research utilization such as the Stetler Model and the Iowa Model to be the concept of developing the clinical nursing practice guidelines or evidence based practice. Nowadays, there has been a widespread move towards developing the clinical nursing practice guideline. The CNPG development processes were developed based on the concept of evidence-based practice by many organizations to facilitate the steps for guideline developers clearly (NHMRC, 1998; Tilokskulchai, 2006).

The CNPG developmental processes have been presented by several organizations, such as National Health and Medical Research Council (NHMRC), New Zealand Guidelines Group (NZGG), The Thailand Center for Evidence Based Nursing and Midwifery, Scottish Inter-collegiate Guidelines Network (SIGN), Agency for Health Care Research and Quality (AHRQ), National Institute for Health

and Clinical Excellence (NICE), Royal College of Nurses (RCN), and Registered Nurse Association of Onatrio (RNAO). These organizations have described the procedures of CNPG development to evaluation step by step.

There are different and various methods to develop CNPG which may contain 4 steps up to 18 steps depending on the agreement of each organization. However, the major procedures from each organization are similar which are based on the concept of evidence-based practice (Thongchai, 2005). The major procedures include defining the problem, using the multi-disciplinary panel to oversee the development of guidelines, systematic review and analyze the scientific evidence, formulate the draft of guidelines, integrate the comments from experts and user, piloting test, and revision.

There are several organizations that have identified methods for developing the CNPG. Each organization has advantages and disadvantages. According to reviewing the CNPG development methods from assessable data of four organizations including NHMRC (1998), NICE (2007), RNAO (2002), and NZGG (2001), the researcher found that the method of NHMRC was most suitable to be used in this study because it is flexible and adaptable to varying local conditions, which suit with the context of the workplace at NMCU. The details of dissemination and implementation also provide effective suggestions.

The National Health and Medical Research Council (NHMRC) is one of the organizations that describe the procedures to develop the CNPG clearly. There are 12 procedures to develop the clinical nursing practice guideline (NHMRC, 1998) which are described as follows:

1. *Determining the need and scope of guidelines*

The important aspect for developing the guidelines should be started with specifying exact problems and objectives of the guidelines. When selecting the topics there must be a clear problem that may well be resolved by the establishment and dissemination of guidelines on what is the most appropriate practice. The problems could relate to the extent of the health burden, cost, variations in practice, or the availability of evidence.

2. *Convene a multi-disciplinary panel to oversee the development of guidelines*

The panel is a group of members of the guidelines developing team. The panel should consist of representatives from all the relevant groups. The panel's precise composition will depend on the nature of the guidelines but should be designed to encourage the expression of diverse interests. The size of group of panel should be consisting of 5-15 people.

3. *Define the purpose of the guidelines and the target audience for the guidelines*

Before proceeding, the panels should clarify the purpose of guidelines and target audience for the guidelines. This should involve a careful specification of the conditions and clinical problems that are an issue, the type of care providers and consumers for whom the guidelines are intended, the types of settings in which the guidelines will be employed, and the interventions to be evaluated. As a minimum requirement, separate consumer and practitioner documents should be produced, but the panel will also need to determine whether the

different documents are required for different care providers in different clinical settings and for different consumers.

4. Identify health outcomes

The objective of clinical practice guidelines is to improve health outcomes and encourage the appropriate use of resources. The appropriate outcome measures will differ depending on what is under consideration.

5. Review and analyze the scientific evidence.

Methods for reviewing and analysis of the literature range from highly formal, quantitative information syntheses to subjective synopses of observational data (NHMRC, 1998). The more formal reviewing is more credible and validates the resulting guidelines. The guidelines should clearly state the methods used to review the literature. There also should be rigorous discussion about any gaps in the literature. The literatures should be reliable and have up-to- date scientific evidence. A reviewing method should be well organized and describe clearly in the guideline development process. The reviewing method may include:

Step 1: Identify the accurate index words related to the guideline topic which will help to access the conformable evidences.

Step 2: Identify the sources of database and methods such as computerized databases, the books, nursing journals, and nursing articles, doctoral dissertation, and master's thesis, and expert opinion, etc.

Step 3: Analyze the levels and grading of recommendation of the evidence.

Levels of evidence

Trustworthiness or qualities of guidelines depend on the scientific evidences which are brought to utilize for developing the clinical practice guidelines (Tilokskulchai, 2006; Joanna Briggs Institute [JBI], 2008).

At present, there are many organizations which determine the levels of evidence. There are several explanations about levels of evidence from international acceptable organizations such as NHMRC (1998), JBI (2008), and SIGN (2008) which described the quality of evidence, categorizes the different types of clinical evidence and level of evidence, study design, and quality of study (NHMRC, 1998; Tilokskulchai, 2006). In general, there are 4 levels of categorized evidence but some of organization separated the minor levels in sub-level such as 1a, 1+, 1++ which may be consider for feasibility, appropriateness, meaningfulness, effectiveness, and economic evidence of the evidence (NHMRC, 1998; JBI, 2008).

Level 1: Evidence obtained from a systematic review, meta-analyses (JBI, 2008; SIGN, 2008). Meta analyses or systematic review of all relevant randomized controlled trials (NHMRC, 1998; SIGN, 2008), or one or more large experimental studies with narrow confidence intervals (JBI, 2008).

Level 2: Evidence obtained from at least one properly-designed randomized controlled trial (NHMRC, 1998) or one or more smaller RCTs with wider confidence intervals or quasi-experimental studies (without randomization) (JBI, 2008).

Level 3: Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and

allocation not randomized, cohort studies, case-control studies, or interrupted time series with or without a parallel control group, or from comparative studies with historical control, two or more single arm studies (NHMRC, 1998; JBI, 2008) or observational studies without control group (JBI, 2008).

Level 4: Evidence obtained from case series, either post-test or pre-test/post-test (NHMRC, 1998), expert opinion (JBI, 2008; SIGN, 2008), physiology bench research, or consensus (JBI, 2008).

According to literature reviewed, a ranking of the level of evidence of each organization is different. SIGN (2008) ranks the cohort studies and case control studies in the level 2, but NHMRC (1998) and JBI (2008) rank these kinds of study in the level 3.

In conclusion, there are 4 levels of evidence but the criterion of study design of each organization may be different.

Grading of recommendation

Classification of grading of recommendation is related to the level of confidence of the evidences (NHMRC, 1998). In general, there are 3 or 4 levels of the strength of recommendation or the alphabets A-C to classify the grading of recommendation (JBI, 2008). NHMRC (1998) suggested that determinative of strength of recommendation have 4 levels because if it is divided into more than 4 level, it will be difficult to differentiate the characteristic of the study. The grading of recommendation should consider feasibility, appropriateness, meaningfulness, and effectiveness of the evidence (JBI, 2008).

Grading of recommendation of evidence is very important for the evidence-based practice especially for developing the clinical

practice guidelines which uses the scientific evidence base to support. Grading of recommendation can manifest the difference of the trustworthiness of the evidence and establish the confidence to use evidence appropriately with its quality for further useful practices. In this research, the researcher used the levels of evidence and grading of recommendation of the Joanna Briggs Institute (JBI, 2008) because there are clear and understandable descriptions for each level of evidence and grading of recommendation. The details of the levels of evidence and grading of recommendation of the Joanna Briggs Institute (JBI, 2008) are described in Table 1 and Table 2, respectively.

Table 1

The levels of evidence of the Joanna Briggs Institute

Levels of Evidence	Feasibility F(1-4)	Appropriateness A(1-4)	Meaningfulness M(1-4)	Effectiveness E(1-4)	Economic Evidence
1	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Meta-analysis(with homogeneity) of experimental studies (eg RCT with concealed randomisation) OR One or more large experimental studies with narrow confidence intervals	Metasynthesis (with homogeneity) of evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
2	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	One or more smaller RCTs with wider confidence intervals OR Quasi-experimental studies(without randomisation)	Evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
3	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Cohort studies (with control group) b. Case-controlled c. Observational studies(without control group)	Evaluations of important alternative interventions comparing a limited number of appropriate cost measurement, without a clinically sensible sensitivity analysis
4	Expert opinion	Expert opinion	Expert opinion	Expert opinion, or physiology bench research, or consensus	Expert opinion, or based on economic theory

Note. From *"History of JBI Levels of Evidence and Grades of Recommendation,"* by Joanna Briggs Institute (JBI), 2008 [Electronic version]. Retrieved August 12, 2009, from http://www.joannabriggs.edu.au/pdf/about/Levels_History.pdf.

Table 2

The grades of recommendations of the Joanna Briggs Institute

Grade of Recommendations	Feasibility	Appropriateness	Meaningfulness	Effectiveness
A.	Strong support that merits application	Strong support that merits application	Strong support that merits application	Strong support that merits application
B.	Moderate support that warrants consideration of application	Moderate support that warrants consideration of application	Moderate support that warrants consideration of application	Moderate support that warrants consideration of application
C.	Not supported	Not supported	Not supported	Not supported

Note. From *"History of JBI Levels of Evidence and Grades of Recommendation,"* by Joanna Briggs Institute (JBI), 2008 [Electronic version]. Retrieved August 12, 2009, from http://www.joannabriggs.edu.au/pdf/about/Levels_History.pdf.

6. Formulate the guideline

Formulate the guideline should be constructed on the basis of the available scientific evidence of the probable outcomes associated with different clinical interventions. Developer and panel should consider the probable outcomes of each intervention, comparison of the outcomes/benefits for alternative intervention, risks, including economic appraisal.

In the steps to formulate the draft guideline, the developer and panel should arrange appropriate activities such as conferences, group discussion, or workshop for sharing opinions among developers, panel, and involve care providers to conclude important points of guidelines content.

During the drafting of guidelines development duration, the panel should also develop a plan for disseminating and implementing the guideline which may use many strategies for effective disseminating and implementing of guidelines depending on the nature of the guidelines and the target group.

The developer and panels should also develop a strategy to design a plan of guideline's evaluation to ensure that the guidelines are evaluated properly and revised whenever necessary. Evaluation of the guidelines should be planned to measure cover structure, process, and outcomes of the guidelines. Data collection methods such as questionnaires, observation, interview, or data from patient profile etc should be included.

The draft of guideline should have an important composition including 1) name of guideline, name list of panel, position, working place, introduction, a table of content; 2) purpose and scope of guideline, target audience, and outcomes; 3) developmental process; 4) definition of terms which are used in guideline; 5) content of the guideline with specific of level of evidence; 6) procedure to solve problems of the complicate and important steps (if any); 7) references; and 8) appendix.

7. Formulate a dissemination and implementation strategy

During the guidelines developmental phase, the panel should develop a plan for disseminating and implementing the guidelines. The plan should target all the potential users and define and recommend processes that encourage them to adopt and implement the guideline.

8. Formulate an evaluation and revision strategy

This procedure should be conducted by all the panels through discussion. The panel should develop a strategy designed to ensure that the guidelines are evaluated properly and revised whenever necessary. Activities in this step include specifying both short-term and long-term frameworks for evaluation and identifying the participants and panels who will conduct the studies. This procedure can be conducted during or after the process of developing the guideline.

9. The guidelines themselves

This procedure produces the complete version of the guidelines. The format of the guidelines should be presented as clear and concise as possible. Guidelines may be presented as a free text, as a flow chart or in any other format that facilitates comprehension. Abbreviations and symbols should be consistent and easy to follow. Important terms and terms that might be misinterpreted should be defined.

10. Reporting on the guideline development process

The report should contain a description of the guideline development process, the dissemination and implementation and evaluation and revision strategies, and matters for future research.

11. Assessing the guideline document

The adequacy of the guidelines document should be evaluated by examining whether it conforms to the principles outlined in this guideline. The Institute of

Medicine has developed a provisional instrument for prospectively assessing the soundness of guidelines and the method by which they were developed. The adequacy of the draft guideline document should be evaluated by examining the content validity by experts, whether it conforms to the principles outlined or not. The experts should be in the specific area of content of guideline and should have expertise in the guideline development. At least three experts should be used for evaluation. Guidelines should be referred for examination to a wider group of interested parties that may not have already been involved, such as experts who are practicing clinicians, clinical colleges and allied health and professional organizations, and consumer groups. The final guidelines should take into account the comments received during the consultations and in response to pilot testing in 6the implementing phase.

12. Consultation

The guidelines should be referred for examination to a wider group of interested parties that may not have already been involved, such as practicing clinicians, clinical colleges, allied health, professional organization, consumer groups, and local health authorities, etc. The consultants are dependent on the content and context of the developed guideline.

According to the handbook of the NHMRC, it is described that the procedures and the sequence of the steps in handbook are intended as a guide rather than a prescription for developing guideline. Working context and convenience of developer and panel requires that the procedures should be assembled or taken in an order that differs from what is described in paper (NHMRC, 1998). In this study, the method to develop the CNPG-TS for preterm infant in NMCU was modified to 7 steps which categorized into 2 phases.

Phase 1: CNPG-TS development. This phase comprised of 5 steps including 1) determining the need and scope of a CNPG-TS on developmental care for

preterm infants in NMCU and current nursing practice of NMCU nurses for providing tactile stimulation as developmental care by conducting a discussion with NMCU nurses, 2) convening guideline developing panels to define the purpose, target audience, and outcomes of the developed CNPG-TS, 3) reviewing and analyzing the scientific evidence by searching and retrieving relevant literatures related to the concept and existing intervention studies related to tactile stimulation for preterm infants in order to determine the duration, location, action, intensity, frequency, and sensation of tactile stimulation, 4) formulating the evidence-based CNPG-TS of tactile stimulation for preterm infants and develop the instruments for evaluating the outcomes of implementation of the CNPG-TS, and 5) assessing the CNPG-TS by experts and panels.

Phase 2: CNPG-TS evaluation. This phase comprised of 2 steps including 1) disseminating the CNPG-TS in routine nursing care at the NMCU immediate care setting, and 2) evaluated the practicability of the CNPG-TS.

Evaluation of clinical nursing practice guideline

Evaluation of clinical nursing practice guidelines is a fundamental procedure. The evaluation process is aimed to evaluate the validity of the guidelines and effectiveness of its implementation (NHMRC, 1998). Evaluation of guideline can be assessed with target group of 5-10 cases or in period of 1-2 weeks (Sitthi-amorn, Supachutthikul, Ratanalert, & Ratchaboriruk, 2000) The result of evaluation from pilot testing are used to revise the guideline appropriately and publish the guideline format before implementing the guideline in working place (NHMRC, 1998; Thongchai, 2005).

Thongchai (2005) described that the plan for CNPG evaluation should be covered 1) Structure evaluation, 2) Process evaluation, and 3) Outcome evaluation. The methods of

structure and process evaluation are more commonly used to evaluate the preliminary implementation of clinical practice guidelines (Tilokskulchai, 2006).

Process evaluation documents the extent to which the program was implemented as designed and is serving the target population (Basinski, 1995). Practical considerations of process evaluation may be measured such as; the contribution of guideline to any changes in clinical practice, guideline provider's knowledge, guideline provider's understanding, and guideline provider's ability and consistency of using guideline. The process evaluation can be examined on the practicability, complexity-simplicity, user's satisfaction, efficiency, and problems of using the guideline (Thongchai, 2005; RNAO, 2002).

In this study, the developed CNPG-TS have been examined for process evaluation in term of practicability of the CNPG-TS. The method and criteria to examine a practicability of the CNPG-TS were used a method of testing criterion-related (predictive) validity of Mason. Mason (1994) described concept and method of development and evaluation of standard of care. Although the CNPG differ from standard of care, but aim of process evaluation of the CNPG and criterion-related (predictive) validity of standard of care are similar in term of to test an ascertainment of positive outcomes result on patient.

Mason (1994) described that the criterion-relation validity essential for all process of implementation of the standard of care. The criterion-relation validity consists of two parts to be evaluated including 1) process standard/content standard, and 2) outcome standard. After testing has been completed, if a consistent positive relationship exists between the effective implementation of the process/content standards that result in positive outcomes for the patients, then the process/content and outcome standards are valid and ready to be implemented.

According to explanation of Mason (1994), the part of testing process standard is a method to test nurses' efficacy to implement each activity in process standard to patient. It is

similar to examine the nurses' practicability of using each statement of the CNPG to provide care for target population. Thus, the method of data collection and criteria for testing process standard of Mason (1994) was used to examine the practicability of the CNPG in this study.

Method of data collection

1. Preparing a data collecting instrument by using that all statements of process outcome were written and listed in logical order, the columns for "practicable", "impracticable", and "no practice" also put to check the nurses' action at least 10 times in each statement.

2. Collecting data by appropriate technique. There are two techniques for collecting data to establish the validity of process standard which described as follows.

2.1 Nurses implement each statement for at least 10 times, the practice could be provided by many nurses who are involved in providing care.

2.2 Insist that one nurse implements all statements in the process standard for at least 10 times.

3. Interpreting the practicability of the nurses on each statement in process standard. Of the ten observations, if there are nine or ten marked in the "practicable" column, the process standard is validity.

For collecting and interpreting data of practicability of the CNPG in this study, the researcher also used a similar collecting data instrument (Nurse's Practicability Questionnaire, Appendix B) which put and list all the statements in each guideline of the CNPG. Each statement of the CNPG was practiced by many nurses who involve in providing care as described in technique 2.1. After complete implementing the CNPG-TS in each case, the NMCU nurse participants answer the questionnaire by themselves whether those statements are practicable or not.

The researcher chose technique 2.1 because it is suitable for a working system of NMCU nurses that turn over 8 hours-shift in a day, the statement in the CNPG could be practiced by many nurses who are involved in providing care for preterm infants in each shift. It is more convenient and practicable than the technique 2.2 which need the same nurse to practice all statements of the CNPG for 10 times. Then, the researcher interpreted the data by counting the practicing of the nurses in each statement. Each statement must be practicable for nine or ten times from ten times of practice (or more than 90%), the statement is validity and practicable to implement. But if there are eight or fewer marks for "practicable", it is obvious that the statement is not valid. The researcher needs to readjust or improve the statement by reviewing more evidence or consulting with experts, then conduct more evaluation or add more additional interventions (Mason, 1994).

Conclusion of the literature review

Tactile stimulation is significant for physical growth, health and neurological development of preterm infants. It has positively effects on a variety of physiologic and developmental outcomes which include: faster weight gained, improved neurobehavioral status, shorter length of stay in the hospital, decreased apnea, required less oxygen, fewer behavioral signs of stress and associated with hypoxia.

The reviewed of literature has shown that there are different types of tactile stimulation including tactile/kinesthetic stimulation, multi sensory stimulation, multi-modalities sensory stimulation, gentle human touch (GHT), and infant massage. The diverse qualities of each of the tactile stimulation were viewed as the component of tactile stimulation which includes duration, location, action, intensity, frequency, and sensation. Each type of tactile stimulation is appropriate for different conditions, development, body weight, and age of the preterm infants. NMCU nurses need to understand that each preterm

infant has different developmental and behavioral characteristics. Moreover, they also undergo very rapid changes in their physical growth and clinical condition. For this reason, the nurses should be able to correctly observe and assess the condition and behavioral of the preterm infants and make decision to choose appropriate tactile stimulation to the preterm infants to ensure safety and effectiveness.

The clinical nursing practice guideline (CNPG) is one approach which is acceptable and more disseminated for using in health care practices. Because of the development of the CNPG is based on efficient evidence based literatures and previous passed trialed studies, thus the CNPG benefit to help the nurse to make decisions for appropriate practices in order to improve quality of nursing care.

The CNPG of tactile stimulation for preterm infant need to be developed in order to improve quality of tactile stimulation as developmental care for preterm infant in NMCU. The literature reviewed of existing knowledge regarding tactile stimulation for preterm infant is believed to lead to clarify of the conclusion evidence about appropriate techniques or method of tactile stimulation for preterm infants, environment preparation for providing tactile stimulation for preterm, and infant's responses or behavioral cues assessment. Nevertheless, there is no CNPG of tactile stimulation found. Therefore, the CNPG of tactile stimulation for preterm infants in NMCU was developed by using the framework of Australian National Health and Medical Research Council (NHMRC, 1998) and based on the reliable scientific evidence regarding tactile stimulation. The CNPG was evaluated for the practicability to be reliable tool to assist the NMCU nurses to make decisions for providing appropriate tactile stimulation in order to improve quality of developmental care in NMCU.

CHAPTER 3

RESEARCH METHODOLOGY

The aims of the developmental study were to develop and evaluate the CNPG-TS for preterm infants in the NMCU. There were two phases in this study: 1) the CNPG-TS development phase, and 2) the CNPG-TS evaluation phase. The details of each phase are described as follow:

Phase 1: The CNPG-TS development

This phase comprised five steps: 1) determining the need and scope of the CNPG-TS, 2) convening the development panel to define the purpose, target audience, and outcomes of the CNPG-TS, 3) reviewing and analyzing the scientific evidence related to concept and existing intervention studies of tactile stimulation for preterm infants, 4) formulating the CNPG-TS and developing instruments for evaluating the practicability of the CNPG-TS, and 5) assessing the CNPG-TS by experts and panels.

Step 1: Determining the need for and scope of the CNPG-TS.

Objective: The objective of this step was to discover the problems, need, and scope of the CNPG-TS for preterm infants in the NMCU.

Participants: In this step, five registered nurses and three practical nurses working in the NMCU, Songklanagarind Hospital and willing to participate were selected as participants by purposive sampling.

Procedures: The procedures for determining the need and scope of the CNPG-TS were as follows:

1. Reviewed and analyzed accessible literature and research related to developmental problems of preterm infants in the neonatal care unit, examined current practices and problems in providing tactile stimulation as developmental care in the neonatal care unit, and considered the need of using the CNPG-TS in developmental care for preterm infants in the NMCU.

2. Informally observed routine nursing care at the NMCU. Informal observation was conducted for one week, in order to explore the current practice of tactile stimulation in developmental care for the preterm infants in the NMCU.

3. Informally interviewed the participants. The 10-minute face-to-face interview for each participant was conducted in order to determine the participant's perspectives of their problems, difficulties, and needs for providing tactile stimulation in developmental care in the NMCU.

4. All information was gathered, summarized, and analyzed. The problems and needs in providing tactile stimulation as developmental care in the NMCU were identified based on the literature reviewed, informal observation and interviewing.

The researcher found that the NMCU nurses realized that the accurate technique of tactile stimulation is essential and should to be properly applied in routine nursing practice in order to promote proper development of the NMCU preterm infants, especially as an effective developmental intervention for preterm infants who are clinical stable and preparing to be discharged from NMCU.

However, problems in the current practice of providing tactile stimulation for preterm infants in NMCU still occurred resulting in inconsistent and inaccurate practice. In current practices, the nurses usually provided only tapping on

the infant's bottom, or rocking for consolation, which were mostly not contingent in the care of the infants' cues. The causes of problems were: 1) a variety of methods of tactile stimulation for preterm infants, 2) nurses lacked knowledge and skill to make clear decisions in selecting appropriate types of tactile stimulation for developmental care of preterm infants, and 3) a lack of evidence for basing guidance in the ward to control the quality, accuracy, and safety of providing tactile stimulation for preterm infants in NMCU.

As discussed with the head-nurse of the NMCU, a 5 year strategic plan was established in this setting to promote developmental care for preterm infants by using effective clinical nursing practice guidelines. Tactile stimulation also had been included in the plan as one of the developmental care interventions needing to be reviewed to further develop the CNPG. However, by current practice, there was still a lack of proper promotion to practice appropriate tactile stimulation in the NMCU. Thus, the development of the CNPG-TS also supported the organization's policy.

5. Consequently, the researcher proposed a solution for those problems by developing the clinical nursing practice guideline (CNPG-TS) of tactile stimulation for preterm infants in the NMCU.

Step 2: Convening the development panel to define the purpose, target audience, and outcomes of developing the CNPG-TS.

Objectives: The objectives of this step were 1) to convene the CNPG-TS development panel who would be the participants to oversee the development of the guidelines, 2) to define purpose of the CNPG-TS, 3) to define the target audience for using the CNPG-TS, and 4) to identify outcomes of the CNPG-TS.

Participants: Five professional level registered nurses were selected as participants to be the CNPG-TS development panel by purposive sampling based on the following inclusion criteria:

- Willing to be a member of the CNPG-TS development panel
- Possessing more than 10 years of working experience with preterm infants in the NMCU
- Possessing previous experience/training in developmental care
- Have previously participated in developmental care or having previously applied any clinical practice guidelines in nursing care

Procedures: The procedures of this step were as follows:

1. The CNPG-TS development panel was recruited by the researcher.
2. Meetings for consultation of the CNPG-TS development panel were held twice.

The first meeting was a 2 hour meeting held in order 1) to explain the need and scope of development of the CNPG-TS, and 2) to encourage the panelists to decide the purpose, target audience, and desired outcomes of the CNPG-TS.

The second meeting was a 2 hour meeting held 2 days later in order to reach a conclusion on the purposes, target audiences, and outcomes of the CNPG-TS. From the second meeting, the conclusion was described as follows:

The purpose of the CNPG-TS was to provide evidence based guidelines for NMCU nurses on order to make decisions in providing appropriate and safe tactile stimulation to preterm infants in NMCU.

The target audiences for the CNPG-TS

1) The users would be registered nurses who were involved in providing care to preterm infants during their hospital stay at the NMCU, Songklanagarind Hospital.

2) The target population were medically stable preterm infants who were admitted to the NMCU, Songklanagarind Hospital.

The expected short-term outcome of this study was to design a practical CNPG-TS for nursing in providing appropriate, safe, and accurate tactile stimulation for preterm infants in the NMCU, Songklanagarind Hospital.

Step 3: Reviewing and analyzing scientific evidence

Objectives: The objective of this step was to determine appropriate scientific evidence in order to develop reliable content in the CNPG-TS for preterm infants in the NMCU.

Participants: Researcher and the CNPG-TS development panel

Procedures: There were five steps as follows:

1. The researcher searched, retrieved relevant articles, and reviewed literature related to tactile stimulation by identifying pertinent intervention studies and systematic reviews concerning tactile stimulation from many sources.

The index words included “tactile stimulation”, “tactile stimulation in preterm”, “touch stimulation”, “developmental care”, “neonatal intermediate care unit”, “hospitalized preterm infant”, “developmental care guidelines”, “guidelines for tactile stimulation”, and “recommendations for tactile stimulation” used to guide the search of relevant literature.

Computerized databases included MEDLINE, CINAHL, the Joanna Briggs Institute, the Cochrane Collaboration Group, Clinical Evidence, and Pubmed. In addition, relevant references, books, nursing journals, and nursing articles such as Neonatal Network, Pediatrics, Pediatric Nursing, Maternal and Child Nursing, Clinics in Perinatology, and Nursing Research were used. Other databases used for searching were the library, doctoral dissertations, master theses, journals, and all citations in each database. Moreover, the reference lists of all retrieved papers were also searched for this study.

2. There were 23 selected recorded evidences related to tactile stimulation for preterm infant in NMCU. These occurred during years 1998 - 2010. The researcher analyzed, critiqued, and identified the levels and grades of recommendations of the relevant evidences based on the levels of evidence and grading of recommendation of the Joanna Briggs Institute (JBI) (JBI, 2008) as this institute provided clear and understandable descriptions for each level of evidence and grading of recommendation. The selected evidences included: level 1A = 5 papers, level 1B = 1 paper, level 2A = 1 paper, level 3A = 11 papers, level 3B = 1 paper, and level 4A = 5 papers.

3. The analyzed evidences were rated and categorized into 3 topics which included 1) appropriate methods of tactile stimulation and criteria to select preterm infants for providing appropriate tactile stimulation techniques, 2) appropriate environmental management for providing tactile stimulation to preterm infants, and 3) evaluating and management of the preterm infant's behavioral and physiological responses.

At this step, the researcher organized meetings among the development panel to discuss appropriateness and practicability of the selected reliable evidence. The meeting resulted in the panelists accepting all evidence which was related to environment preparation and infant responses or behavioral cues assessment. However, for techniques of tactile stimulation for preterm infants, there are 2 techniques of tactile stimulation selected by the panelists and by the researcher based on reliable, clear, and practicable methods that would be applied for preterm infants in NMCU, Songklanagarind Hospital. The selected techniques included 1) Gentle Human Touch (GHT), and 2) the multisensory stimulation: auditory, tactile, visual, and vestibular stimulation (ATVV). The panel explained that these two methods were quite flexible with practicable instructions, as well as being appropriate in length which would not disturb their routine nursing care.

4. The researcher summarized the selected reliable data into the table format to prepare for formulating the CNPG-TS.

Step 4: Formulating the CNPG-TS and developing instruments for evaluating the practicability of the CNPG-TS

Objectives: The objectives of this step were 1) to formulate the CNPG-TS to provide appropriate tactile stimulation, and 2) to develop instruments for evaluating the practicability of the CNPG-TS.

Participants: Researcher and the CNPG-TS development panel

Procedures: The procedures of this step were separated into two parts including 1) formulating the CNPG-TS and 2) developing instruments for evaluating the practicability of the CNPG-TS.

Formulating the CNPG-TS: The procedure for formulating the CNPG-TS were as follows:

1. The researcher collated applicable academic information of appropriate tactile stimulation interventions from reliable scientific sources.

2. The researcher developed the preliminary *CNPG-TS*. The content of CNPG-TS consisted of 3 parts: 1) appropriate techniques of tactile stimulation for each condition of preterm infants; 2) environment preparation for providing tactile stimulation for preterm infants; and 3) infant's responses or behavioral cues assessment.

Developing the instrument for evaluating the practicability of the CNPG-TS: The procedure for developing the instrument was as follows:

1. The researcher prepared all statements of the CNPG-TS.

2. The researcher studied existing literature related to developing an instrument for evaluating practicability of nurses using the CNPG.

3. The researcher developed the preliminary Nurse's Practicability Questionnaire by using all statements of the CNPG-TS. The columns for "practicable", "impracticable", and "no practice" were put next to the column of each statement. The contents of the preliminary Nurse's Practicability Questionnaire consisted of 3 parts: 1) Demographic Characteristics Questionnaire, 2) Recording Form of Nurses' Practices of the CNPG-TS, and 3) Problems, limitations, and recommendations of using the CNPG-TS Questionnaire.

Step 5: Assessing the CNPG-TS by experts and the panel.

Objectives: The objectives of this step were 1) to assess the content validity of the CNPG-TS and the Nurse's Practicability Questionnaire, and 2) to assess the reliability of the CNPG-TS and the Nurse's Practicability Questionnaire.

Participants: The participants of this step were three experts, the researcher, and the CNPG-TS development panel.

Instruments: Three instruments included 1) the first draft of the CNPG-TS, 2) the Nurse's Practicability Questionnaire, and 3) Content Validity Evaluation Form.

Procedures: The procedures of this step were as follows:

1. The first draft of the CNPG-TS was presented to a focus group among the CNPG-TS development panel to assess its applicability, appropriateness and understanding of content, format, and language.

2. The second draft of the CNPG-TS and the newly developed instruments were verified for content validity by 3 experts in neonatology. The 3 experts comprised 1 neonatologist, 1 registered nurse who was working in the NMCU at Songklanagarind Hospital, and 1 nursing lecturer from the Department of Pediatric Nursing, Faculty of Nursing, Prince of Songkla University. Each expert independently rated the relevance of each statement of each instrument by using the Content Validity Evaluation Form.

It was found that 93 of 95 statements of the CNPG-TS were very relevant to the objective whereas the other 2 statements related to temperature control were quite relevant. For the Nurse's Practicability Questionnaire, it was found that all questions were very relevant to the content of the CNPG-TS and the objective of this

study. Thus, the CNPG-TS and the Nurse's Practicability Questionnaire were accepted for use in this study (Waltz, Strickland, & Lenz, 2005).

3. The researcher developed the third draft of the CNPG-TS and revised the Nurse's Practicability Questionnaire in response to the suggestions of experts with agreement of the advisor and co-advisor. The details of both revised versions of the instruments are as follows.

1) The third draft of the CNPG-TS for Preterm Infants in the NMCU (Appendix A).

It is composed of five guidelines, five sub-guidelines, and ninety-five statements: Guideline 1 Criteria to select preterm infants for providing appropriate tactile stimulation techniques (5 statements); Guideline 2 Appropriate environmental management for providing tactile stimulation to preterm infants [sub-guideline 2.1 Sound management (15 statements), sub-guideline 2.2 Light management (3 statements), and sub-guideline 2.3 Temperature control (18 statements)]; Guideline 3 Evaluating a preterm infants readiness and management before receiving tactile stimulation (7statements); Guideline 4 Evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile stimulation and management (6 statements); and Guideline 5 Methods of tactile stimulation [sub-guideline 5.1 Method of Gentle Human Touch (GHT) (17 statements), and sub-guideline 5.2 Method of Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) (24 statements)]

2) The Nurse's Practicability Questionnaire (Appendix B) was developed by the researcher to evaluate the practicability of the CNPG-TS based on existing literature. It consisted of 4 parts: 1) Demographic Characteristics

Questionnaire, 2) Recording Form of the Preterm Infant's Behavioral and Physiological Responses, 3) Recording Form of Nurses' Practices of the CNPG-TS, and 4) Problems, Limitations, and Recommendations of Using the CNPG-TS Questionnaire. The details of each part of the questionnaire are described as follows:

Part 1: Demographic Characteristics Questionnaire was used to collect demographic characteristic of NMCU nurses and preterm infants who participated in using the CNPG-TS. The details of demographic characteristics are described as follows.

Section 1 Demographic characteristics of NMCU nurses included age, educational level, work duration in the NMCU, previous experience or training in tactile stimulation or developmental care, and previous participation in developing or using any clinical practice guidelines for preterm infant care.

Section 2 Demographic characteristic of preterm infants included: gender, gestational age, current age when receiving tactile stimulation, current body weight, type of tactile stimulation, duration of receiving tactile stimulation, current clinical signs or diagnoses, and current treatments**.**

Part 2: Recording Form of the Preterm Infant's Behavioral and Physiological Responses was developed for this study to assess the preterm infant's behavioral and physiological responses before, during, and after receiving tactile stimulation in accordance with the instructions of the CNPG-TS. The behavioral and physiological responses before and after receiving tactile stimulation including axillary temperature, state of consciousness, heart rate and characteristics, respiratory rate and characteristics, oxygen saturation level, and behavioral responses.

Part 3: Recording Form of the Nurse's Practices of the CNPG-TS was developed for this study to assess nurse's practicability in using the CNPG-TS. It provided a checklist of 95 statements of the CNPG-TS for the nurses to choose whether each statement in the CNPG-TS was practicable (score=1) or impracticable (score=0) in a real situation of using the CNPG-TS with preterm infants. The statement that was "no practice" was scored 0. The scores of each statement collected ten times were summed and transformed to percentage of agreement. At least 90% of agreement of practicability was considered acceptable for each guideline statement (Mason, 1994).

Part 4: Problems, Limitations, and Recommendations of Using the CNPG-TS Questionnaire consisted of two opened-ended questions. This allowed NMCU nurses to describe problems or limitations of using the CNPG-TS and their suggestions to improve the content and methods of the CNPG-TS.

Phase 2: The CNPG-TS evaluation

The phase of evaluating guidelines consisted of two steps including 1) disseminating the CNPG-TS (step 6), and 2) evaluating the practicability of the CNPG-TS (step 7). Details of these steps are as follows:

Step 6: Disseminating the CNPG-TS

Objective: The objectives of this step were 1) to assess the preliminary appropriateness of the instruments, and 2) to disseminate and implement the CNPG-TS into routine nursing practice in NMCU.

Procedures: The procedures of this step were separated into two parts including 1) assessing the preliminary appropriateness of the instruments, and 2) disseminating and implementing the CNPG-TS

1) *Assessing the preliminary appropriateness of the instruments*: The procedures for assessing the instruments were as follow:

Participants: The participants were the researcher and four registered nurses. The four registered nurses were selected as participants to assess the preliminary appropriateness of the instruments by purposive sampling based on the following inclusion criteria:

- Be willing to participate in this step of the study
- Be involved in providing care for preterm infants when admitted at NMCU, Songklanagarind Hospital
- Have experience of more than 6 months in caring for preterm infants in NMCU

Instruments: 1) the third draft of the CNPG-TS, 2) the Nurse's Practicability Questionnaire, and 3) the simulated environment in separated room (preterm dolls, an incubator with covered cloth, a baby crib, and a portable radiant warmer)

Procedures: The procedures for assessing the preliminary appropriateness of the CNPG-TS were as follows:

1. The four registered nurses were selected to be participants by the researcher following the inclusion criteria.

2. The researcher described the method of assessing preliminary appropriateness to the participants.

3. The CNPG-TS was given to each participant to study one day before assessing

4. The simulated environment in a separated room was set up by the researcher

5. Each participant was provided the Nurse's Practicability Questionnaire. Then they independently provided tactile stimulation within a controlled environment in the simulated environment following the instruction in the CNPG-TS.

6. The researcher discussed with four participants the preliminary appropriateness of the instruments (understanding of language, number of statements, time spent, preliminary practicability, problems of the CNPG-TS implementation). All of the participants commented that the instruments were understandable, practicable and appropriate. However, the participants gave two suggestions as follows:

- In order to be more understandable, the contents in the section of evaluating a preterm infant's readiness and management before receiving tactile stimulation (Guideline 3) should be organized into a figure or table.
- There was a need to provide more details of explanations for the step of providing tactile stimulation on an infant's back and face (ATVV method).

7. The researcher revised the CNPG-TS based on suggestions of the participants with agreement of the advisor and co-advisor.

2) *Disseminating and implementing the CNPG-TS*: The procedures for dissemination and implementation of the CNPG-TS were as follows:

Participants: The participants included the researcher, the CNPG-TS development panel, and nurses in the NMCU, Songklanagarind Hospital.

Instruments: 1) the third draft of the CNPG-TS, 2) mini-posters of the CNPG-TS, and 3) electronic nurse's note on the ward's computer.

Procedures: The procedures for disseminating and implementing of the CNPG-TS were as follows:

1. The researcher and the CNPG-TS development panel organized a discussion session to develop strategies for the dissemination and implementation of the CNPG-TS.

2. The researcher and the CNPG-TS development panel disseminated the CNPG-TS as follows:

2.1. The researcher and panel presented a plan of using the CNPG-TS to NMCU nurses during a formal ward meeting.

2.2. The mini-poster of the CNPG-TS was displayed on the board arranged in the NMCU.

2.3. The researcher and the CNPG-TS development panel provided three sessions of two-hour education and discussion for NMCU nurses and health care team who were interested. There were three main topics presented and discussed during those two hour sessions including:

1) The importance and current practices of tactile stimulation for preterm infants in the NMCU

2) Nursing staff past experience of using clinical nursing practice guideline to improve nursing care for preterm infants in the NMCU

3) Understanding the using of the CNPG-TS of tactile stimulation for preterm infants in the NMCU.

The three two-hour sessions of education and discussion were organized on August 2, 4, and 5, 2011. There were a total of thirty participants in these activities (10-11 participants/session) including twenty-two NMCU nurses, eight nurse assistants, and two medical staff.

2.4. The CNPG-TS development panel put "providing tactile stimulation in accordance with the CNPG-TS" as one of nursing care procedures for preterm infants into an electronic nurse's note in the ward's computer, which is used for providing information of nursing care for nurses in the next shift.

3. The researcher and the CNPG-TS development panel considered the results of efforts to disseminate the CNPG-TS. It was found that the NMCU nurses who were involved in providing care for preterm infants in NMCU, Songklanagarind Hospital had become committed to using the CNPG-TS for preterm infants.

Step 7: Evaluating the practicability of the CNPG-TS

Objectives: The objective of this step was to examine the practicability of the CNPG-TS of tactile stimulation for preterm infants by NMCU nurses.

Participants: The participants were

1) Fourteen nurses who were working in the NMCU, Songklanagarind Hospital. The participants were selected purposively based on the following inclusion criteria:

- Involved in providing care for preterm infants when admitted at NMCU, Songklanagarind hospital
- Experience of more than 6 months in caring for preterm infants in NMCU
- Willing to participate in this study

2) Forty preterm infants were selected purposively based on the following inclusion criteria:

- Gestational age ≥ 27 weeks
- Current body weight ≥ 750 grams
- Current age ≥ 2 days
- Clinical stable
- No respiratory distress syndrome and normal oxygen saturation (88-100 % in healthy preterm infants or > 82-88% in preterm infants with BPD). If the infant had bronchopulmonary dysplasia, only GHT can be provided
- At least 3 or more days post operation and no wet surgical wound/ risk of infected wound
- No complications: Without omphalocele, gastroschisis, abdominal and chest wound, myelomeningocole, meningocoele, sub temperature (BT < 36.8^{o}C), severe neonatal sepsis, neonatal seizure, intraventricular hemorrhage,

hyperbilirubinemia with phototherapy, contagious skin disease, congenital heart disease with congestive heart failure, and necrotinizing enterocolitis

- No endotracheal tube or oxygen box. If the infant has oxygen flow in an incubator with continuous positive airway pressure via nasal prong (nasal CPAP), or nasal prongs, only GHT can be provided
- Not while receiving blood transfusion
- Not while receiving phototherapy
- More than 30 minutes after feeding and without vomiting during feeding

There were two types of tactile stimulations including GHT and ATVV provided to the preterm infant-participants in this study. Thus, specific inclusion criteria varied for preterm infant-participants who received GHT and who received ATVV as described in Guideline 1: criteria to select preterm infants for providing appropriate tactile stimulation techniques (Appendix A).

Because details of the CNPG-TS are covered in the instructions for providing GHT and ATVV for preterm infants in an incubator and in a crib, thus these 40 preterm infants were divided into 4 sub-groups depending on their type of bed and appropriate type of tactile stimulation in receiving all of the steps of the instructions of the CNPG-TS as much as possible. The preterm infants were divided into 4 sub-groups: 10 preterm infants who were in incubators and received GHT, 10 preterm infants who were in incubators and received ATVV, 10 preterm infants who were in cribs and received GHT, and 10 preterm infants who were in cribs and received ATVV.

Instruments: 1) The third draft of the CNPG-TS for Preterm Infants in the NMCU (Appendix A), and 2) the Nurse's Practicability Questionnaire (Appendix B).

Procedures: The procedures of this step were separated into 2 phases including 1) the preparation phase, and 2) the data collection phase. The details of each phase are described as follows.

1. Preparation phase

1.1 Preparation for NMCU nurse participants: The procedures in the preparation phase for NMCU nurses consisted of 3 steps as follows.

1) The researcher informed each of nurse participant regarding the process of implementation and evaluation of the CNPG-TS, and the details of the workshop to the participants. Subsequently, consent was obtained through a written consent inform (Appendix C)

2) The researcher provided the third draft of the CNPG-TS to the participants to study at least one day in advance of the workshop.

3) Three sessions of the workshop was organized by the researcher, the CNPG-TS developing panels, and NMCU Quality Development Group. Fourteen participants were divided into three groups (four to five nurses per group) to attend the workshop. The duration of each session was 3 hours. Each group chose their available time to attend. Each participant had to attend at least one session of the workshop to ensure that they would be able to perform tactile stimulation. Activities of the workshop sessions are described as follows:

3.1) The researcher described the instructions of the CNPG-TS to the participants. Then, the participants discussed this with the researcher to clarify their understanding about the CNPG-TS.

3.2) The researcher organized a simulated environment in the workshop room. The simulated environment included 1) preterm dolls, 2) incubator with covered cloth, 3) baby crib, and 4) portable radiant warmer.

3.3) The researcher demonstrated and discussed with the participants how to prepare the environment before providing tactile stimulation to preterm infants.

3.4) The researcher demonstrated each step of tactile stimulation within the simulated environment. The participants continued practicing every step following the researcher's instruction until they were able to completely and accurately perform all steps of tactile stimulation.

In conclusion, the workshop sessions were conducted for three sessions within two days on August 28-29, 2011. There were two sessions on 28 August, one in the morning and another in the afternoon. There was one session on 29 August morning. However, three participants were unable to return demonstrate complete or correct procedures. Thus, the researcher provided an extra workshop session on 29 August afternoon for training until these participants were able to completely and accurately perform all steps of the tactile stimulation.

1.2 Preparation for preterm infants: The procedures in the preparation phase for preterm infants consisted of 3 steps as follows.

1) The forty preterm infants were selected to be participants purposively based on the specified inclusion criteria for each type of tactile stimulation (Table 3)

2) The researcher informed the parents of each preterm infant regarding the objectives and descriptions of the study, and the instructions of tactile stimulation following the CNPG-TS. Subsequently, consent was obtained through a written consent form (Appendix D)

3) The selected preterm infants were separated according to type of bed (incubator/crib) and type of appropriate tactile stimulation into 4 groups: Group 1) preterm infants who were incubators and were appropriate to receive GHT; Group 2) preterm infants who were in incubators and were appropriate to receive ATVV; Group 3) preterm infants who were in cribs and were appropriate to receive GHT; and Group 4) preterm infants who were in cribs and were appropriate to receive ATVV.

2. Data collection phase

The data collection phase was a phase for the implementation and evaluation of the practicability of the CNPG-TS by NMCU nurse participants. The implementation of the CNPG-TS started immediately after the participants completed the workshop session demonstrating accurate performance of tactile stimulation. Simultaneously, the CNPG-TS was implemented by the nurse participants at NMCU, Songklanagarind Hospital. The method of implementation is described below.

2.1 There were two major types of tactile stimulation applied in the CNPG-TS: 1) Gentle Human Touch (GHT), and 2) Multisensory stimulation: Auditory, Tactile, Visual, & Vestibular (ATVV).

2.2 Each type of tactile stimulation in this study had to be provided to two groups of preterm infants who were in incubators and cribs. This arrangement resulted in four groups of infants as described previously.

2.3 Each nurse participant had to provide both types of tactile stimulation (GHT and ATVV) based on the instructions given in the CNPG-TS at least one time to any preterm infant. One preterm infant in each group could receive an appropriate type of tactile stimulation by any nurse participant several times.

2.4 After the nurse participants completed providing tactile stimulation in each case, they were asked to complete the Nurse's Practicability Questionnaire.

2.5 The duration of the data collection phase was continued until each method (GHT and ATVV) was provided 10 times to each preterm infant in an incubator and 10 times to each preterm infant in a crib, respectively.

2.6 The researcher collected and analyzed the data of the nurse's practicability of using the CNPG-TS.

2.7 The researcher conducted a meeting with the nurse participants and the CNPG-TS development panel to discuss the practicability and problems of using the CNPG-TS as well as recommendations and plans for promoting its sustainability.

Conclusion of method of evaluating the practicability of the CNPG-TS is shown as Figure 3.

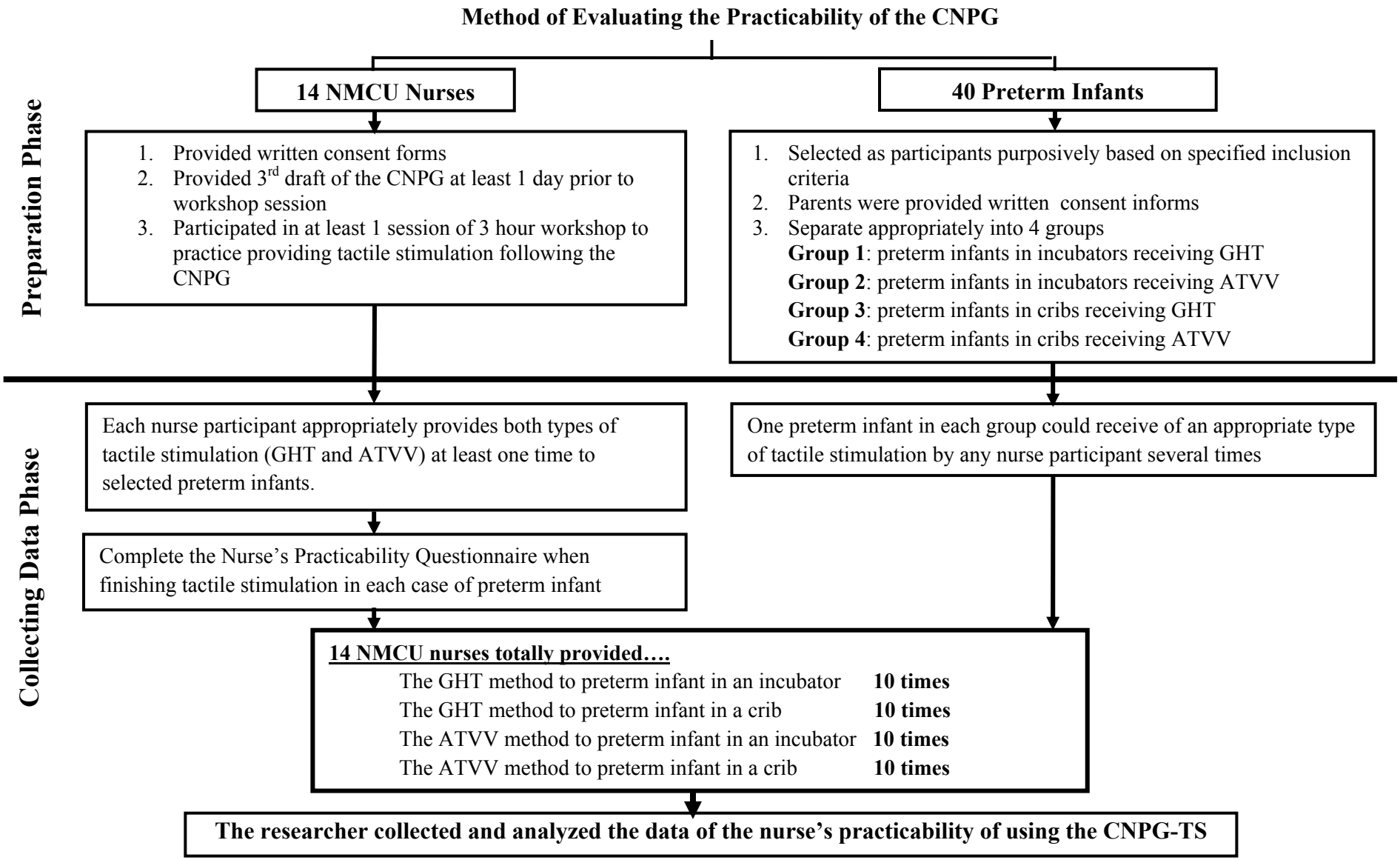

Figure 2 Method of Evaluating the Practicability of the CNPG-TS for Preterm Infant in the NMCU

Data analysis

Data analysis was conducted as follows:

1. Descriptive statistics including frequency, mean, standard deviation, minimum, and maximum were used to analyze the demographic characteristics of the NMCU nurse participants and preterm infants.

2. Descriptive statistics including frequency, mean, standard deviation, minimum, and maximum were used to analyze the preterm infant's behavioral and physiological responses.

3. Descriptive statistics including frequency and percentage were used to describe the nurse's practicability of using the CNPG-TS for each statement.

4. Narrative writing was used to describe the open-ended statements of problems, limitations, and recommendations of using the CNPG-TS.

Ethical consideration

This study was approved by the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University, and the Ethical Committee of Songklanagarind Hospital. The study poses no physical or mental risk to the nurses and preterm infants participated in this study. All nurse-participants and the parents of preterm infant-participants received information about the objectives of the study, all procedures of the study, and their rights before participating in the study. They could ask any questions and could withdraw their participation at any time during the study without any adverse consequence to their career or to their treatment.

While the nurse participants were providing tactile stimulation adhering to the CNPG-TS, the researcher and nurse participants closely observed for signs of distress and the clinical conditions of each preterm infant including changing of skin color, more than 30 seconds, hyperextension of extremities, frantic activity, squirming or twitching, tremors, yawning, clenched fists, hiccoughs, or abnormal physiological responses. If the preterm infant presented any signs of distress or clinical changes, the nurses had to stop providing tactile stimulation immediately and provided appropriate consolation until the preterm infant was calm and stable.

The NMCU nurse-participants and parents of preterm infant-participants were reassured that the data collected in the study would be used only for the benefit of the research report. Their names were withheld for confidentiality. Code numbers were assigned to all participants and only code numbers were used for analysis. The tape recording of group discussion meetings were erased after the study was completed. After the explanation of the study, they were invited and asked to sign informed consent forms before participating in the study.

CHAPTER 4

RESULTS AND DISSCUSSION

This chapter presents the results of the study according to the research questions. The major findings were discussed accordingly.

Part 1 Demographic characteristics

1.1 Demographic characteristics of NMCU nurses

1.2 Demographic characteristics of preterm infants

Part 2 Behavioral and physiological responses of preterm infants

Part 3 Components and activities of the CNPG-TS for preterm infants in NMCU, Songklanagarind hospital

Part 4 Nurses' practicability of using the CNPG-TS for preterm infants in NMCU, Songklanagarind hospital

Results

Part 1 Demographic characteristics

Demographic data in this study consisted of demographic characteristics of 14 NMCU nurses and 40 preterm infants. These 40 preterm infants were divided into 4 sub-groups: 10 preterm infants in incubators and received GHT, 10 preterm infants in incubators and received ATVV, 10 preterm infants in cribs and received GHT, and 10 preterm infants in cribs and received ATVV. The findings were described as follows.

1.1 Demographic characteristics of NMCU nurses

Fourteen NMCU nurses participated in this study. The mean of nurses' age was 37 years (*SD* = 6.41, min = 26, max = 50). Most of them had bachelor's degree (*n* = 12). Their average of working duration in NMCU was 15.57 years (*SD* = 6.82, min = 3, max = 28). Most of them had previous participation in developing or using clinical practice guidelines for preterm infant care (*n*=10) and did not have previous experience or training on tactile stimulation or developmental care (*n* = 12) (Table 3).

Table 3

Frequency, mean, standard deviation, skewness value, kurtosis value, minimum, and maximum of characteristics of NMCU nurses (N=14)

Characteristics	*f*
Age (years)	
M = 37, *SD* = 6.41, Skewness value = 0.00, Kurtosis value = 0.05	
min = 26, *max* = 50	
Education level	
Bachelor's degree	12
Master's degree	2
Working duration in NMCU (years)	
M = 15.57, *SD* = 6.82, Skewness value = 0.19, Kurtosis value = 0.30	
min = 3, *max* = 28	
Previous experience/ training on tactile stimulation or developmental care	
Yes	2
No	12
Previous participation in developing or using any clinical practice guidelines for preterm infant care	
Yes	10
No	4

1.2 Demographic characteristics of preterm infants

Forty preterm infants participated in this study. They were divided into 4 sub-groups: preterm infants in an incubators and received GHT (group 1), preterm infants in an incubator and received ATVV (group 2), preterm infants in a crib and received GHT (group 3), and preterm infants in crib and received ATVV (group 4). The demographic characteristics of them are described by group as follow (Table 4).

Table 4

Frequency, mean, standard deviation, skewness value, kurtosis value, minimum, and maximum of demographic characteristics of preterm infants in each group (n=10/group)

Characteristics	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Gender				
Male	5	6	8	6
Female	5	4	2	4
Gestational age (weeks)	*M* = 28, *SD* = 0.67, *Skewness value* = 0.00, *Kurtosis value* = 0.60, *min* = 27, *max* = 29	*M* = 30.80, *SD* = 1.32, *Skewness value* = 0.40, *Kurtosis value* = 1.48 *min* = 29, *max* = 32	*M* = 27.70, *SD* = 0.48, *Skewness value* = 0.51, *Kurtosis value* = 0.92, *min* = 27, *max* = 28	*M* = 30.20, *SD* = 0.92, *Skewness value* = 0.49, *Kurtosis value* = 1.35, *min* = 29, *max* = 31
Age (days)	*M* = 16, *SD* = 3.80, *Skewness value* = 0.44, *Kurtosis value* = 0.59, *min* = 10, *max* = 22	*M* = 16.5, *SD* = 5.06, *Skewness value* = 0.28, *Kurtosis value* = -0.87, *min* = 8, *max* = 23	*M* = 24.10, *SD* = 6.94, *Skewness value* = 0.86, *Kurtosis value* = -1.42, *min* = 15, *max* = 30	*M* = 11.9, *SD* = 3.21, *Skewness value* = 0.05, *Kurtosis value* = 1.44, *min* = 8, *max* = 16
Current body weight (grams)	*M* = 1,179, *SD* = 160.24 *Skewness value* = 0.07, *Kurtosis value* = 1.71, *min* = 1,000, *max* = 1,380	*M* = 1,761, *SD* = 257.27, *Skewness value* = 0.53, *Kurtosis value* = 1.57, *min* = 1,500, *max* = 2,100	*M* = 2,235, *SD* = 712.12 *Skewness value* = 0.48, *Kurtosis value* = 1.39, *min* = 1,320, *max* = 2,950	*M* = 2,016, *SD* = 186.86, *Skewness value* = 0.44, *Kurtosis value* = 1.15, *min* = 1,750, *max* = 2,200

Table 4 (Continued)

Characteristics	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Duration of receiving tactile stimulation (minutes)				
10	10	0	5	0
15	0	10	5	10
Current clinical signs or diagnose*				
Stable	10	10	10	10
Normal oxygen saturation	10	10	10	10
Bronchopulmonary dysplasia	4	0	7	0
Current treatments *				
Crib	0	0	10	10
Incubator with air servo control mode	6	8	0	0

Note. *Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 4 (Continued)

Characteristics	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Current treatments (Continue) *				
Incubator with skin servo control mode	4	2	0	0
Nasal CPAP	4	0	7	0
Peripheral intravenous infusion	5	2	3	0
Enteral feeding	10	10	10	10
Performing tactile stimulation after feeding:				
< 30 minutes	0	0	0	0
> 30 minutes	10	10	10	10

Note. *Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

1.2.1 Demographic characteristics of preterm infants who were in incubators and received GHT

Ten preterm infants were in this sub-group. Half of them were boys. The average of gestational age was 28 weeks (*SD* = 0.67, *min* = 27, *max* = 29). Their mean current body weight was 1,179 grams (*SD* = 160.24, *min* = 1,000, *max* = 1,380). Their mean current age was 16 days (*SD* = 3.8, *min* = 10, *max* = 20). All of them received GHT for 10 minutes. All of them had stable current clinical signs and normal oxygen saturation. Nearly half of them had bronchopulmonary dysplasia (*n* = 4). None of them had these following clinical signs or diagnoses including: sub temperature, apnea, respiratory distress, severe birth asphyxia, postoperative period less than 3 days/ wet surgical wound/ risk for infected wound, neonatal seizure, congestive heart failure, omphalocele, gastroschisis, abdominal or chest wound, myelomeningocole, meningocoele, severe neonatal sepsis, intraventricular hemorrhage, esophageal reflux, contagious skin diseases, visual disorders, congenital heart disease, necrotinizing enterocolitis, hypoglycemia, and hyperbilirubinemia with phototherapy.

More than half of them were in incubators with an air control servo mode (*n* = 6) and the rest of them were in incubators with a skin control servo mode (*n* = 4). Half of them received peripheral intravenous infusion and enteral feeding. Nearly half of them had a continuous positive airway pressure (CPAP) via a nasal cannula (*n* = 4). None of them was during these following treatments including: endotracheal tube, oxygen flow in an incubator, nasal prongs, central intravenous infusion, umbilical arterial catheter, umbilical venous catheter, blood transfusion, and

phototherapy. The GHT were started in a half of infants after feeding time more than 30 minutes.

1.2.2 Demographic data of preterm infants who were in incubators and received ATVV

Ten preterm infants consisting of six boys and four girls participated in this sub-group study. The average of gestational age was 31 weeks (*SD* = 1.32, *min* = 29, *max* = 32). Their mean current body weight was 1,761 grams (*SD* = 257.27, *min* = 1,500, *max* = 2,100). Their mean current age was 17 days (*SD* = 5.06, *min* = 8, *max* = 23). All of them received ATVV for 15 minutes. All of them had stable current clinical signs and normal oxygen saturation. None of them had these following clinical signs or diagnoses including: sub temperature, apnea, respiratory distress, bronchopulmonary dysplasia, severe birth asphyxia, postoperative period less than 3 days/ wet surgical wound/ risk for infected wound, neonatal seizure, congestive heart failure, omphalocele, gastroschisis, abdominal or chest wound, myelomeningocole, meningocoele, severe neonatal sepsis, intraventricular hemorrhage, esophageal reflux, contagious skin diseases, visual disorders, congenital heart disease, necrotinizing enterocolitis, hypoglycemia, and hyperbilirubinemia with phototherapy.

Most of them were in incubators with an air control servo mode (*n* = 8) and the rest of them were in incubators with a skin control servo mode (*n* = 2). All of them received enteral feeding and only few of them received peripheral intravenous infusion (*n* = 2). None of them was during these following treatments including: endotracheal tube, oxygen flow in an incubator, nasal prongs, nasal CPAP, central intravenous infusion, umbilical arterial catheter, umbilical venous

catheter, blood transfusion, and phototherapy. The ATVV were started in all of infants after feeding time more than 30 minutes.

1.2.3 Demographic characteristics of preterm infants who were in cribs and received GHT

Ten preterm infants consisting of six boys and four girls participated in this sub-group study. Most of them were boys (n = 8). The average of gestational age was 27.7 weeks (*SD* = 0.48, *min* = 27, *max* = 28). Their mean current body weight was 2,235 grams (*SD* = 712.12, *min* = 1,320, *max* = 2,950). Their mean current age was 24 days (*SD* = 6.94, *min* = 15, *max* = 30). Half of them received GHT for 10 minutes and the rest of them received it for 15 minutes. All of them had stable current clinical signs and normal oxygen saturation. More than half of them had bronchopulmonary dysplasia (*n* = 7). None of them had these following clinical signs or diagnoses including: sub temperature, apnea, respiratory distress, severe birth asphyxia, postoperative period less than 3 days/ wet surgical wound/ risk for infected wound, neonatal seizure, congestive heart failure, omphalocele, gastroschisis, abdominal or chest wound, myelomeningocole, meningocoele, severe neonatal sepsis, intraventricular hemorrhage, esophageal reflux, contagious skin diseases, visual disorders, congenital heart disease, necrotinizing enterocolitis, hypoglycemia, and hyperbilirubinemia with phototherapy.

All of them were in cribs and received enteral feeding. More than half had a continuous positive airway pressure (CPAP) via a nasal cannula (*n* = 7). Three of them also received peripheral intravenous infusion during receiving GHT. None of them was during these following treatments including: endotracheal tube, oxygen flow in an incubator, nasal prongs, central intravenous infusion, umbilical

arterial catheter, umbilical venous catheter, blood transfusion, and phototherapy. The GHT were started in all of infants after feeding time more than 30 minutes.

1.2.4 Demographic data of preterm infants who were in cribs and received ATVV

Ten preterm infants consisting of six boys and four girls participated in this sub-group study. The average of gestational age was 30 weeks (*SD* = 0.92, *min* = 29, *max* = 31). Their mean current body weight was 2,016 grams (*SD* = 186.86, *min* = 1,750, *max* = 2,200). Their mean current age was 12 days (*SD* = 3.21, *min* = 8, *max* = 16). All of them received ATVV for 15 minutes. All of them had stable current clinical signs and normal oxygen saturation. None of them had these following clinical signs or diagnoses: sub temperature, apnea, respiratory distress, bronchopulmonary dysplasia, severe birth asphyxia, postoperative period less than 3 days/ wet surgical wound/ risk for infected wound, neonatal seizure, congestive heart failure, omphalocele, gastroschisis, abdominal or chest wound, myelomeningocole, meningocoele, severe neonatal sepsis, intraventricular hemorrhage, esophageal reflux, contagious skin diseases, visual disorders, congenital heart disease, necrotinizing enterocolitis, hypoglycemia, and hyperbilirubinemia with phototherapy.

All of them were in cribs, and received enteral feeding. None of them was during these following treatments: endotracheal tube, oxygen flow in an incubator, nasal prongs, nasal CPAP, central intravenous infusion, peripheral intravenous infusion, umbilical arterial catheter, umbilical venous catheter, blood transfusion, and phototherapy. The ATVV were started in all of infants after feeding time more than 30 minutes.

Part 2 Behavioral and physiological responses of preterm infants

The behavioral and physiological responses of preterm infants before, during, and after receiving tactile stimulation are described by group as follow (Table 5).

Table 5

Frequency, mean, standard deviation, skewness value, kurtosis value, minimum, and maximum of behavioral and physiological responses of preterm infants before, during, and after receiving tactile stimulation in each group (n=10/group)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Before receiving tactile stimulation				
Axillary temperature (°C)	*M* = 36.92, *SD* = 0.10, Skewness value = 0.40, Kurtosis value = 0.67, *min* = 36.8, *max* = 37.1	*M* = 36.98, *SD* = 0.10, Skewness value = 0.40, Kurtosis value = 0.67, *min* = 36.8, *max* = 37.1	*M* = 36.98, *SD* = 0.10, Skewness value = 0.40, Kurtosis value = 0.67, *min* = 36.8, *max* = 37.1	*M* = 36.96, *SD* = 0.14, Skewness value = 0.37, Kurtosis value = 1.62, *min* = 36.8, *max* = 37.1
State of consciousness				
Quiet sleep	0	0	0	0
Active sleep	0	0	0	0
Drowsy	4	2	5	0
Quiet alert	6	3	5	4
Active alert	0	5	0	6
Cry	0	0	0	0

Note. Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Before receiving tactile stimulation (Continued)				
Heart rate (bpm)	*M* = 148, *SD* = 6.04, Skewness value = 0.09, Kurtosis value = 0.20, *min* = 136, *max* = 156	*M* = 148.6, *SD* = 3.78 , Skewness value = 0.61, Kurtosis value = -0.43, *min* = 142, *max* = 154	*M* = 147, *SD* = 4.64, Skewness value = 0.15, Kurtosis value = 0.84, *min* = 140, *max* = 154	*M* = 143.6, *SD* = 5.64 , Skewness value = 0.00, Kurtosis value = 0.97, *min* = 136, *max* = 152
Heart rate regular	10	10	10	10
Respiratory rate (bpm)	*M* = 50.40, *SD* = 2.80, Skewness value = 0.69, Kurtosis value = 1.44, *min* = 48, *max* = 54	*M* = 48.6, *SD* = 3.66, Skewness value = 0.19, Kurtosis value = 1.16, *min* = 40, *max* = 52	*M* = 48, *SD* = 4.22, Skewness value = 0.16, Kurtosis value = 0.36, *min* = 40, *max* = 54	*M* = 46.20, *SD* = 3.33, Skewness value = 0.51, Kurtosis value = 0.54, *min* = 42, *max* = 52
Respiratory rate characteristics *				
Regular rhythm	8	8	3	9
Irregular rhythm	2	2	7	1
No apnea	10	10	10	10
No respiratory distress	10	10	10	10

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Before receiving tactile stimulation (Continued)				
Oxygen saturation (%)	*M = 97.2, SD = 1.32,* Skewness value = *0.13,* Kurtosis value = *0.56, min = 95, max = 99*	*M = 95.5, SD = 2.92,* Skewness value = *0.02,* Kurtosis value = *1.20, min = 92, max = 99*	*M = 91.1, SD = 4.25,* Skewness value = *0.15,* Kurtosis value = *0.78, min = 86, max = 98*	*M = 97.40, SD = 1.58,* Skewness value = *0.28,* Kurtosis value = *1.38, min = 95, max = 99*
Behavioral responses *				
Engagement behaviors				
Quite alert	0	5	0	6
Calm and still	10	10	10	10
Wide and bright eyes	6	5	5	6
Focused attention on stimuli	6	5	2	5
Smooth and gentle motor movement	8	6	7	6
Opened palms	4	6	7	7
Gentle movement of fingers and slightly flex fingers	4	6	7	7

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
Before receiving tactile stimulation (Continued)				
Disengagement behaviors				
Yawning	0	2	0	0
Eyes closed tight	0	0	5	3
Avertable the gaze	3	0	4	5
Stretched limbs	2	0	3	0
Stretched palms	2	0	0	0
Jittery or jerky movements	2	0	0	0
During receiving tactile stimulation				
Behavioral responses *				
Engagement behaviors				
Quite alert	6	10	7	10
Calm and still	10	10	10	10
Wide and bright eyes	6	10	7	10

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
During receiving tactile stimulation				
Behavioral responses *				
Engagement behaviors				
Focused attention on stimuli	3	5	6	5
Smooth and gentle motor movement	8	0	5	10
Opened palms	4	10	5	10
Gentle movement of fingers and slightly flex fingers	4	10	5	10
Disengagement behaviors				
Frowned or grimace	0	3	0	2
Closed tightly Eyes	0	3	0	2
Avertable the gaze	2	5	2	4
Stretched limbs	0	3	0	3
Drowsy	0	0	3	0

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
During receiving tactile stimulation (Continued)				
Heart rate (HR) and characteristics				
Normal responses*				
120-160 beats/minute	10	10	10	10
Increased HR no more than 20% of baseline value	10	10	10	10
Decreased HR no more than 20% of baseline value	10	10	10	10
Regular rate	10	10	10	10
Abnormal responses	0	0	0	0
Respiratory rate (RR) and characteristics				
Normal responses*				
30-60 breaths per minute	10	10	10	10
Regular RR or increased RR no more than 20% of baseline value	10	10	10	10
No decreased RR	10	10	10	10
No respiratory distress	10	10	10	10
No apnea	10	10	10	10

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
During receiving tactile stimulation (Continued)				
Abnormal responses*	0	0	0	0
Oxygen saturation level				
Normal responses				
88-100% (healthy infant)	6	10	3	10
> 82-88% (BPD infant)	4	0	7	0
Decreased no more than 2%	10	10	10	10
No continuously decreased	10	10	10	10
Abnormal responses	0	0	0	0
Sub-temperature signs				
No signs	10	10	10	10

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
After receiving tactile stimulation				
Axillary temperature (℃)	*M* = 36.89, *SD* = 0.10, Skewness value = 0.48, Kurtosis value = 0.69, *min* = 36.8, *max* = 37.1	*M* = 36.91, *SD* = 0.09, Skewness value = 0.32, Kurtosis value = 1.30, *min* = 36.8, *max* = 37.0	*M* = 36.93, *SD* = 0.11, Skewness value = 0.06, Kurtosis value = 0.93, *min* = 36.8, *max* = 37.1	*M* = 36.93, *SD* = 0.11, Skewness value = 0.51, Kurtosis value = 0.93, *min* = 36.8, *max* = 37.1
Behavioral responses *				
Engagement behaviors				
Quite alert	0	7	7	7
Calm and still	10	10	10	10
Wide and bright eyes	6	5	7	7
Focused attention on stimuli	6	3	6	7
Smooth and gentle motor movement	8	10	5	6

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
After receiving tactile stimulation (Continued)				
Behavioral responses *				
Engagement behaviors				
Opened palms	4	7	5	6
Gentle movement of fingers and slightly flex fingers	4	6	5	6
Disengagement behaviors				
Drowsy	0	3	3	3
Heart rate (HR) and characteristics				
Normal responses				
120-160 beats/minute	10	10	10	10
Increased HR no more than 20% of baseline value	10	10	10	10
Decreased HR no more than 20% of baseline value	10	10	10	10
Regular rate	10	10	10	10
Abnormal responses	0	0	0	0

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

Table 5 (Continued)

Behavioral/ physiological responses	Group 1	Group 2	Group 3	Group 4
	f	*f*	*f*	*f*
After receiving tactile stimulation (Continued)				
Respiratory rate (RR) and characteristics				
Normal responses				
30-60 breaths per minute	10	10	10	10
Regular RR or increased RR no more than 20% of baseline value	10	10	10	10
No decreased RR	10	10	10	10
No respiratory distress	10	10	10	10
No apnea	10	10	10	10
Abnormal responses	0	0	0	0
Oxygen saturation level				
Normal responses				
88-100% (healthy infant)	6	10	3	10
> 82-88% (BPD infant)	4	0	7	0
Decreased no more than 2%	10	10	10	10
No continuously decreased	10	10	10	10
Abnormal responses	0	0	0	0

Note. * Answered more than one item

Group 1 is group of preterm infants in an incubators and received GHT

Group 2 is group of preterm infants in an incubator and received ATVV

Group 3 is group of preterm infants in a crib and received GHT

Group 4 is group of preterm infants in crib and received ATVV

2.1 Behavioral and physiological responses of preterm infants who were in incubators and received GHT

Before receiving GHT, they had normal axillary temperature between 36.8 to 37.1 ^{o}C with a mean of 36.92 ^{o}C (*SD* = 0.10). More than half of them were at a quiet alert state (n = 6) and four of them were drowsy. All of them had regular rhythm of heart rate with mean of 148 beats per minute (*SD* = 6.04, *min* = 136, *max* = 156). They had respiratory rate between 48 and 54 breaths per minute with mean of 50 breaths per minute (*SD* = 2.80). Most of them had regular rhythm of respiration (n = 8). All of them had no apnea and respiratory distress. The mean of oxygen saturation level was 97.2% (*SD* = 1.32, *min* = 95, *max* = 99). In term of engagement behavioral responses before receiving GHT, all infants were calm and still. Most of them had smooth and gentle motor movement (n = 8), widening and brightening of the eyes (n = 6), focusing attention on stimuli (n = 6). Four of them had opening palms, and gentle moving fingers and slightly flex fingers. A few of them had averting the gaze (n = 3), and stretching limbs (n = 2).

During receiving GHT, the most four engagement behavioral responses were calm and still (n = 10), smooth and gentle motor movement (n = 8), alert (n=6), and widening and brightening of the eyes (n = 6). Only one disengagement behavioral response was occurred which was averting the gaze (n = 2). All of them had normal physiological responses included regular heart rate 120-160 beats per minute, no increased or decreased heart rate more than 20% of baseline value before receiving GHT, regular respiratory rate 30-60 breaths per minute, no increase respiratory rate more than 20% of baseline value, no decreased respiratory rate, and no respiratory distress or apnea. Oxygen saturation level of all infants

decreased no more than 2%. Most of healthy preterm infants had oxygen saturation 88-100% (n = 6) whereas four of BPD infants had more than 82-88%. All of them had no signs of sub temperature.

After receiving GHT, they had normal axillary temperature between 36.8 and 37.1 ^{o}C with mean of 36.89 ^{o}C (*SD* = 0.10). All of them had only engagement behavioral responses. The most four engagement behavioral responses were calm and still (n = 10), smooth and gentle motor movement (n = 8), widening and brightening of the eyes (n = 6), and focuses attention on stimuli (n = 6). All of them also had similar normal physiological responses such as heart rate, respiratory rate and oxygen saturation as the responses during receiving GHT.

2.2 Behavioral and physiological responses of preterm infants who were in incubators and received ATVV

Before receiving ATVV, they had normal axillary temperature between 36.8 and 37.1 ^{o}C with mean of 36.98 ^{o}C (*SD* = 0.10). Half of them were at an active alert state (n = 5), three of them were at a quite alert state and two of them were drowsy. All of them had regular rhythm of heart rate with mean of 149 beats per minute (*SD* = 3.78, *min* = 142, *max* = 154). They had respiratory rate between 40 to 52 breaths per minute with mean of 49 breaths per minute (*SD* = 3.66). Most of them had regular rhythm of respiration (n = 8). All of them had no apnea and respiratory distress. The mean of oxygen saturation level was 95.5% (*SD* = 2.92, *min* = 92, *max* = 99). In terms of engagement behavioral responses before receiving ATVV, all infants were calm and still. Six of them had smooth and gentle motor movement, opening palms, and gentle moving fingers and slightly flex fingers. Half of them were quiet

alert, had widening and brightening of the eyes and focusing attention on stimuli. A few of them had yawning (n = 2).

During receiving ATVV, all of them had engagement behavioral responses such as alert, calm and still, widening and brightening of the eyes, opening palms, and gentle moving fingers and slightly flex fingers. Half of them also presented focusing attention on stimuli. However, four disengagement behavioral responses were also occurred which were averting the gaze (n = 5), frowning or grimacing (n =3), closing eyes tightly (n = 3), and stretching limbs (n = 3). All of them had normal physiological responses included regular heart rate 120-160 beats per minute, no increased or decreased heart rate more than 20% of baseline value Before receiving ATVV, regular respiratory rate 30-60 breaths per minute, no increase respiratory rate more than 20% of baseline value, no decreased respiratory rate, and no respiratory distress or apnea. Oxygen saturation level of all infants decreased no more than 2%. All of healthy preterm infants had oxygen saturation 88-100% and had no signs of sub temperature.

After receiving ATVV, they had normal axillary temperature between 36.8 and 37.0 ^{o}C with mean of 36.91 ^{o}C (*SD* = 0.09). All of them had only engagement behavioral responses. The most four behavioral responses of them were calm and still (n = 10), smooth and gentle motor movement (n = 10), alert (n = 7), and opening palms (n = 7). All of them also had similar normal physiological responses such as heart rate, respiratory rate and oxygen saturation as the responses during receiving ATVV.

2.3 Behavioral and physiological responses of preterm infants who were in cribs and received GHT

Before receiving GHT, they had normal axillary temperature between 36.8 and 37.1 ^{o}C with mean of 36.98 ^{o}C (*SD* = 0.10). Half of them were at a drowsy state and the other five of them were at a quiet alert state. All of them had regular rhythm of heart rate with mean of 147 beats per minute (*SD* = 4.64, *min* = 140, *max* = 154). They had respiratory rate between 40 to 54 breaths per minute with mean of 48 breaths per minute (*SD* = 4.22). Most of them had irregular rhythm of respiration (n = 7). All of them had no apnea and respiratory distress. The mean of oxygen saturation level was 91.1% (*SD* = 4.25, *min* = 86, *max* = 98). In terms of engagement behavioral responses before receiving GHT, all infants were calm and still. Seven of them had smooth and gentle motor movement, opening palms, and gentle moving fingers and slightly flex fingers widening. Half of them also had closing eyes tightly. Four and three of them had averting the gaze and stretching limbs, respectively.

During receiving GHT, the most four engagement behavioral responses were calm and still (n = 10), quiet alert (n = 7), widening and brightening of the eyes (n = 7), and focusing attention on stimuli (n = 6). Only one disengagement behavioral response occurred which was averting the gaze (n = 2). All of them had normal physiological responses included regular heart rate 120-160 beats per minute, no increased or decreased heart rate more than 20% of baseline value before receiving GHT, regular respiratory rate 30-60 breaths per minute, no increase respiratory rate more than 20% of baseline value, no decreased respiratory rate, and no respiratory distress or apnea. Oxygen saturation level of all infants decreased no more than 2%.

Most of BPD infants had more than 82-88 % of oxygen saturation (n = 7) whereas three of healthy preterm infants had 88-100%. All of them had no signs of sub temperature.

After receiving GHT, they had normal axillary temperature between 36.8 and 37.1 ^{o}C with mean of 36.93 ^{o}C (*SD* = 0.11). All of them had only engagement behavioral responses. The most four behavioral responses of them were calm and still (n = 10), alert (n = 7), widening and brightening of the eyes (n = 7), and focuses attention on stimuli (n = 6). Half of them also had smooth and gentle motor movement, opening palms, and gentle moving fingers and slightly flex fingers. All of them also had similar normal physiological responses such as heart rate, respiratory rate and oxygen saturation as the responses during receiving GHT.

2.4 Behavioral and physiological responses of preterm infants who were in cribs and received ATVV

Before receiving ATVV, they had normal axillary temperature between 36.8 and 37.1 ^{o}C with mean of 36.96 ^{o}C (*SD* = 0.14). Most of them were at an active alert state (n = 6), four of them were at a quite alert state. All of them had regular rhythm of heart rate with mean of 144 beats per minute (*SD* = 5.64, *min* = 136, *max* = 152). They had respiratory rate between 42 and 52 breaths per minute with mean of 46 breaths per minute (*SD* = 3.33). Most of them had regular rhythm of respiration (n = 9). All of them had no apnea and respiratory distress. The mean of oxygen saturation level was 97.4% (*SD* = 1.58, *min* = 95, *max* = 99). In terms of engagement behavioral responses before receiving ATVV, all infants were calm and still. Most of them had opening palms (n = 7) and gentle moving fingers and slightly flex fingers (n = 7). Six of them had quiet alert, widening and brightening of

the eyes, and smooth and gentle motor movement. Half of them had averting the gaze. A few of them had closing eyes tightly (n = 3).

During receiving ATVV, all of them had engagement behavioral responses such as alert, calm and still, widening and brightening of the eyes, smooth and gentle motor movement, opening palms, and gentle moving fingers and slightly flex fingers. Half of them also presented focusing attention on stimuli. However, four disengagement behavioral responses also occurred which were averting the gaze (n = 4), stretching limbs (n = 3), frowning or grimacing (n =2), and closing eyes tightly (n = 2). All of them had normal physiological responses included regular heart rate 120-160 beats per minute, not increased or decreased heart rate more than 20% of baseline value before receiving ATVV, regular respiratory rate 30-60 breaths per minute, no increased respiratory rate more than 20% of baseline value, no decreased respiratory rate, and no respiratory distress or apnea. Oxygen saturation level of all infants decreased no more than 2%. All of healthy preterm infants had oxygen saturation 88-100% and had no signs of sub temperature.

After receiving ATVV, they had normal axillary temperature between 36.8 and 37.1^{o}C with mean of 36.93 ^{o}C (*SD* = 0.11). All of them had only engagement behavioral responses. All of them were calm and still. Most of them had alert (n = 7), widening and brightening of the eyes (n =7), and focusing attention on stimuli (n = 7). All of them also had similar normal physiological responses such as heart rate, respiratory rate and oxygen saturation as the responses during receiving ATVV.

Part 3 Components and activities of the CNPG-TS for preterm infants in NMCU

The components of the first draft of the CNPG-TS for preterm infants in the NMCU, Songklanagarind hospital developed by the researcher based on literature reviews and studies related to tactile stimulations consisted of three guidelines with eighty-eight statements. The three guidelines included guideline 1: methods of tactile stimulation, 41 statements; guideline 2: appropriate environment management for providing tactile stimulation to preterm infants, 36 statements; and guideline 3: infant's behavioral responses assessment, 11 statements.

The second draft was done by five NMCU nurses who were the CNPG-TS development panel using a focus group method. The purpose of performing the focus group was to discuss applicable and appropriate use of the first draft of the CNPG-TS. The focus group was separated into three times because of the time limitation of the nurses-experts. The first time was a discussion of the guideline 1 and 3. The second time was a discussion of the guideline 2. The last time was a conclusion of the second draft of the CNPG-TS. Details from a focus group were as follows.

1. The content of the guideline 1 (methods of tactile stimulation) was revised. The content that described about appropriate characteristics of the infant for each type of tactile stimulation was separated out and reformed into a new guideline. The newly created guideline named "criteria to select preterm infants for providing appropriate tactile stimulation techniques" consisted of five statements which were clear and more convenient for the CNPG-TS users to select the infant before providing tactile stimulation.

2. The content of the guideline 2 (appropriate environmental management for providing tactile stimulation to preterm infants) was separated into

three clearly sub-guidelines: sound management, light management, and temperature control.

3. The content of the guideline 3 (infant's behavioral responses assessment) was revised by adding two more statements about assessment of the infant's behavioral and physiological response after receiving tactile stimulation. Thus, this guideline consisted of thirteen statements.

In conclusion, the second draft of the CNPG-TS consisted of four guidelines with 95 statements.

The third draft was done by doing the content validity of the CNPG-TS by three experts with agreement of the advisor and co-advisor. Details of the revision of the CNPG-TS were as follows.

1. The content of the guideline 4 (infant's behavioral responses assessment) was separated into two guidelines: evaluating a preterm infants readiness and management before receiving tactile stimulation, and evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile. The statements of these two new separated guidelines were clearly described about the method of assessing the infant's response in different periods of providing tactile stimulation: before, during, and after.

2. The content of the guideline 1 (methods of tactile stimulation) was separated into two sub-guidelines: method of Gentle Human Touch (GHT), and method of Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV).

3. The sequence of all guidelines was rearranged to be clearer and easier for practice.

After revisions, the third draft of the CNPG-TS was developed (Appendix A). It consisted of five guidelines, five sub-guidelines, and 95 statements. The development process of guidelines and statements of the CNPG-TS is concluded as Figure 3.

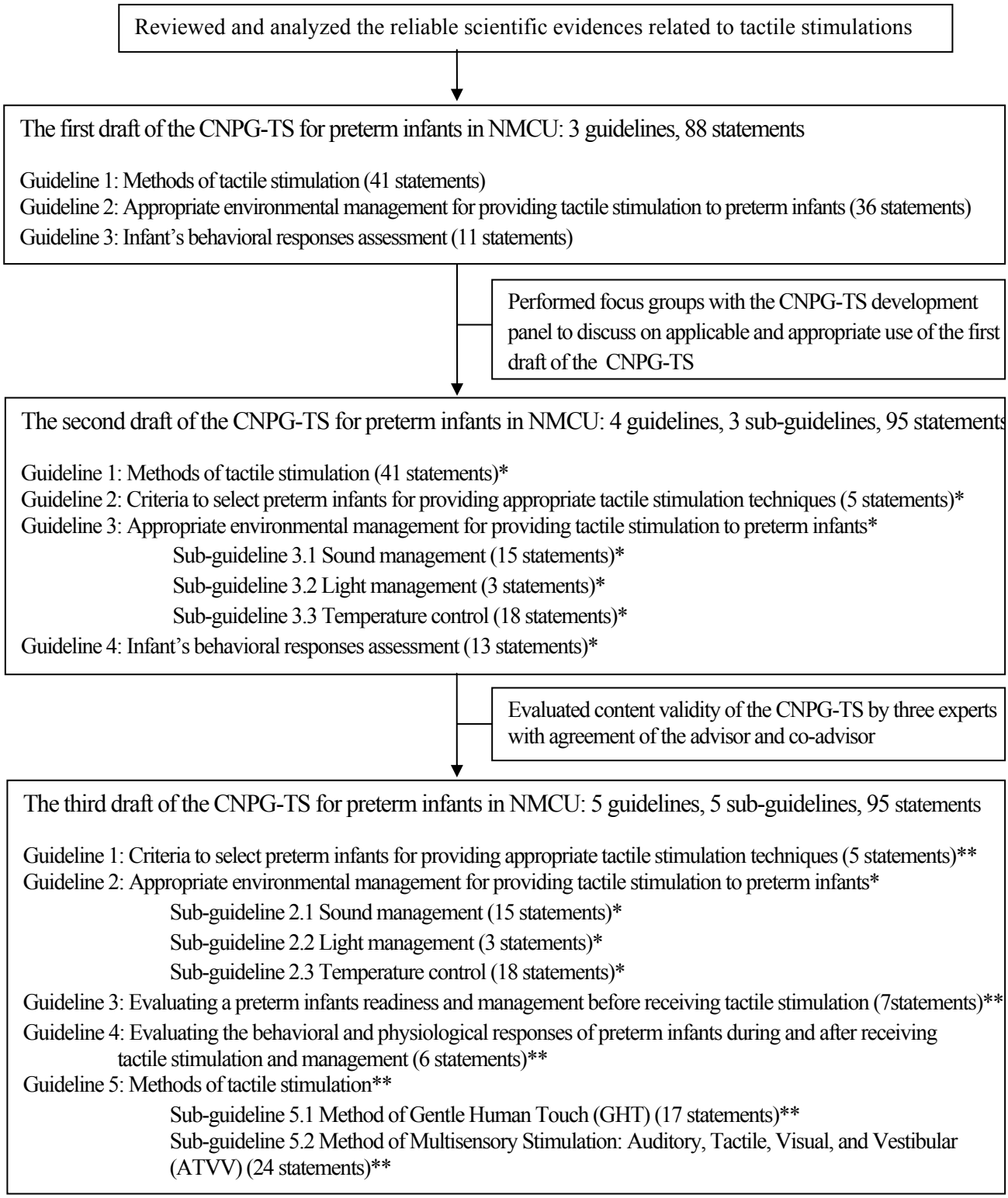

Figure 3 The development process of guidelines and statements of the CNPG-TS

Note. * the revised guideline based on the CNPG-TS development panel meetings

** the revised guideline based on the content validity

Part 4 Nurses' practicability of using the CNPG-TS

4.1 Guideline 1: Criteria to select preterm infants for providing appropriate tactile stimulation techniques

All nurses could practice all of the statements of guideline 1. The details are shown in Table 6 (Appendix E).

4.2 Guideline 2: Management of the appropriate environment for preterm infant to receive tactile stimulation

The results of the nurses' practicability of using the guideline 2 were divided into four parts based on types of beds and stimulation. The details are as follows.

4.2.1 Management of the appropriate environment for preterm infants in incubators and receiving GHT

For sub-guideline 2.1: Sound management and sub-guideline 2.2: Light management, all nurses accurately practiced 100% for all statements. For sub-guideline 2.3: Temperature control, all nurses accurately practiced 100% for 13 out of 18 statements. Eight nurses were able to practice cleaning after defecation and urination (statement 16) whereas the other two could not because the infants did not have elimination. Six nurses were able to practice four sub-statements including one sub-statement of providing appropriate temperature control for an infant in an incubator with an air servo control who had normal body temperature before receiving GHT (statement 5, sub-statement 5.2.1), and three sub-statements of the method for keeping the infant warm in an incubator with an air servo control immediately after finishing tactile stimulation (statement 17, sub-statement 17.2.1-17.2.3) whereas the

other four could not because the infants were in an incubator with a skin servo control. Four nurses were able to practice five sub-statements including one sub-statement of providing appropriate temperature control for an infant in an incubator with a skin servo control who had normal body temperature before receiving tactile stimulation (statement 5, sub-statement 5.3.1), and four sub-statements of the method for keeping the infant warm in an incubator with a skin servo control immediately after finishing tactile stimulation (statement 17, sub-statement 17.3.1-17.3.4) whereas the other six could not because the infants were in an incubator with an air servo control. None of the nurses were able to practice two statements including provide appropriate temperature management for an infant who has sub-temperature (<36.8 ^{0}C) before receiving tactile stimulation (statement 6), and provide appropriate temperature management for an infant who has high body temperature (>37.2^{0}C) before receiving tactile stimulation (statement 7) because there was no infant in this group who had sub-temperature or high body temperature during and after providing tactile stimulation (Table 7, appendix E).

4.2.2 Management of the appropriate environment for preterm infants in incubators and receiving ATVV

For sub-guideline 2.1 Sound management and 2.2 Light management, all nurses accurately practiced 100% for all statements. For sub-guideline 2.3 Temperature control, all nurses accurately practiced 100% for 13 out of 18 statements. Eight nurses were able to practice five sub-statements including two sub-statements of providing appropriate temperature control for an infant in an incubator with an air servo control who had normal body temperature before receiving ATVV (statement 5, sub-statement 5.2.2.1-5.2.2.2), and three sub-statements of the

method for keeping the infant warm in an incubator with an air servo control immediately after finishing tactile stimulation (statement 17, sub-statement 17.2.1-17.2.3) whereas the other two could not because the infants were in an incubator with a skin servo control. Four nurses were able to practice cleaning after defecation and urination (statement 16) whereas the other six could not because the infants did not have elimination. Two nurse were able to practice eight sub-statements including four sub-statement of providing appropriate temperature control for an infant in an incubator with a skin servo control who had normal body temperature before receiving ATVV (statement 5, sub-statement 5.3.2.1-5.3.2.4), and four sub-statements of the method for keep warm the infant in an incubator with a skin servo control immediately after finishing tactile stimulation (statement 17, sub-statement 17.3.1-17.3.4) whereas the other eight could not because the infants were in an incubator with an air servo control. None of the nurses were able to practice two statements including provide appropriate temperature management for an infant who has sub-temperature (<36.8 ^{0}C) before receiving tactile stimulation (statement 6), and provide appropriate temperature management for an infant who has high body temperature (>37.2^{0}C) before receiving tactile stimulation (statement 7) because in this group there was no infant who had sub-temperature or high body temperature during and after providing tactile stimulation (Table 7, appendix E).

4.2.3 Management the appropriate environment for preterm infants in cribs to receiving GHT

For sub-guideline 2.1 Sound management, all nurses accurately practiced 100% for 13 in 15 statements. None of the nurses were able to practice two statements including open-close incubator's windows gently (statement 5) and avoid

placing any equipment on the top of an incubator (statement 14) because there was no infant in this group in an incubator. For sub-guideline 2.2 Light management, all nurses accurately practiced 100% for all statement. For sub-guideline 2.3 temperature management, all nurses accurately practiced 100% for 15 in 18 statements. None of the nurses were able to practice three statements including record incubator temperature before stimulation (statement 2), provide appropriate temperature management for an infant who has sub-temperature (<36.8 ^{0}C) before receiving tactile stimulation (statement 6), and provide appropriate temperature management for an infant who has high body temperature (>37.2^{0}C) before receiving tactile stimulation (statement 7) because in this group there was no infant who had sub-temperature or high body temperature during and after providing tactile stimulation (Table 7, appendix E).

4.2.4 Management the appropriate environment for preterm infants in cribs to receiving ATVV

For sub-guideline 2.1 Sound management, all nurses accurately practiced 100% for 13 out of 15 statements. None of the nurses were able to practice two statements including open-close incubator's windows gently (statement 5) and avoid placing any equipment on the top of an incubator (statement 14) because there was no infant in this group in an incubator. For sub-guideline 2.2 Light management, all nurses accurately practiced 100% for all statement. For sub-guideline 2.3 temperature management, all nurses accurately practiced 100% for 14 out of 18 statements. Seven nurses were able to practice cleaning after defecation and urination (statement 16) whereas the other three could not because the infants did not have elimination. None of the nurses were able to practice three statements including

record incubator temperature before stimulation (statement 2), provide appropriate temperature management for an infant who has sub-temperature (<36.8 ^{0}C) before receiving tactile stimulation (statement 6), and provide appropriate temperature management for an infant who has high body temperature (>37.2^{0}C) before receiving tactile stimulation (statement 7) because in this group there was no infant who had sub-temperature or high body temperature during and after providing tactile stimulation (Table 7, appendix E).

4.3 Guideline 3: Evaluating a preterm infants readiness and management before receiving tactile stimulation

The results of the nurses' practicability of using the guideline 3 were divided into four parts based on types of beds and stimulation. The details are as follows.

4.3.1 Evaluating the readiness of preterm infants in incubators to receiving GHT

All nurse accurately practiced 100% for 4 out of 7 statements. Seven nurses were able to practice providing appropriate care for infant who had only engagement behaviors by starting tactile stimulation (sub-statement 7.1) whereas the other three could not because the infants had at least 1 disengagement behavior before receiving tactile stimulation. Six nurses were able to practice providing appropriate care for the infant in alert states (sub-statement 2.3) whereas the other four could not because the infants were in drowsy state. Four nurses were able to practice two sub-statements of providing appropriate care for the infant in drowsy state (sub-statement 2.2.1-2.2.2) whereas the other six could not because the infants were in alert states.

Three nurses were able to practice five sub-statements of providing appropriate care for infant who had at least 1 disengagement behavior (sub-statement 7.2.1-7.2.5) whereas the other seven could not because the infants had only engagement behaviors before receiving tactile stimulation (Table 8, appendix E).

4.3.2 Evaluating the readiness of preterm infants in incubators to receive ATVV

All nurse accurately practiced 100% for 4 out of 7 statements. Eight nurses were able to practice two sub-statements including providing appropriate care for the infant in alert states (sub-statement 2.3) whereas the other two could not because the infants were in drowsy state, and providing appropriate care for infant who had only engagement behaviors by starting tactile stimulation (sub-statement 7.1) whereas the other three could not because the infants had at least 1 disengagement behavior before receiving tactile stimulation. Two nurses were able to practice seven sub-statements including two sub-statements of providing appropriate care for the infant in drowsy state (sub-statement 2.3) whereas the other eight could not because the infants were in alert states, and five sub-statements of providing appropriate care for infant who had at least 1 disengagement behavior (sub-statement 7.2.1-7.2.5) whereas the other eight could not because the infants had only engagement behaviors before receiving tactile stimulation (Table 8, appendix E).

4.3.3 Evaluating the readiness of preterm infants in cribs to receive GHT

All nurses accurately practiced 100% for 5 out of 7 statements. Five nurses were able to practice three sub-statements including two sub-statements

of providing appropriate care for the infant in drowsy states (sub-statement 2.2.1-2.2.2) whereas the other five could not because the infants were in alert states, and providing appropriate care for the infant in alert states (sub-statement 2.3) whereas the other five could not because the infants were in drowsy state (Table 8, appendix E).

4.3.4 Evaluating the readiness of preterm infants in cribs to receive ATVV

All nurse accurately practiced 100% for 5 out of 7 statements. Five nurses were able to practice six sub-statements including one sub-statement of providing appropriate care for infant who had only engagement behaviors by starting tactile stimulation (sub-statement 7.1) whereas the other five could not because the infants had at least 1 disengagement behaviors before receiving tactile stimulation and five sub-statements of providing appropriate care for infant who had at least 1 disengagement behaviors (sub-statement 7.2.1-7.2.5) whereas the other five could not because the infants had only engagement behaviors before receiving tactile stimulation. (Table 8, Appendix E).

However, none of the nurse from every group was able to practice providing appropriate care when the infant was in sleep states (sub-statement 2.1), providing appropriate care when the infant was in crying states (sub-statement 2.4), and providing appropriate care when the infant has abnormal physiological responses (statement 5) because there was no infant in any group was in sleep state, crying state, and had abnormal physiological responses before providing tactile stimulation, respectively. The details are shown in Table 8 (appendix E).

4.4 Guideline 4: Evaluating the behavioral and physiological responses of preterm infant during and after receiving tactile stimulation and management

The results of the nurses' practicability of using the guideline 4 were divided into four parts based on types of beds and stimulation. The details are as follows.

4.4.1 Evaluating the behavioral and physiological responses of preterm infants in incubators during and after receiving GHT

All nurses accurately practiced 100% for 5 out of 6 statements. Eight nurses were able to practice three sub-statements of providing appropriate care for infant who had engagement behaviors with normal physiological responses during and after providing tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other two could not because the infants had some disengagement behaviors during receiving tactile stimulation. Two nurses were able to practice four sub-statements of providing appropriate care for infant who had disengagement behaviors (excepted hungry and vomiting) with normal physiological responses during and after providing tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other eight could not because the infants had only engagement behaviors with normal physiological responses (Table 9, appendix E).

4.4.2 Evaluating the behavioral and physiological responses of preterm infants in incubators during and after receiving ATVV

All nurses accurately practiced 100% for 5 out of 6 statements. Five nurses were able to practice seven sub-statements including three sub-statements

of providing appropriate care for infant who had engagement behaviors with normal physiological responses during and after providing tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other five could not because the infants had some disengagement behaviors during receiving tactile stimulation, and four sub-statements of providing appropriate care for infant who had disengagement behaviors (excepted hungry and vomiting) with normal physiological responses during and after providing tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other five could not because the infants had only engagement behaviors with normal physiological responses (Table 9, appendix E).

4.4.3 Evaluating the behavioral and physiological responses of preterm infants in cribs during and after receiving GHT

All nurses accurately practiced 100% for 6 in 6 statements (Table 9, Appendix E).

4.4.4 Assessing the behavioral and physiological responses of preterm infants in cribs during and after receiving ATVV

All nurses accurately practiced 100% for 5 out of 6 statements. Six nurses were able to practice three sub-statements of providing appropriate care for infant who had engagement behaviors with normal physiological responses during and after providing tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other four could not because the infants had some disengagement behaviors during receiving tactile stimulation. Four nurses were able to practice four sub-statements of providing appropriate care for infant who had disengagement behaviors (excepted hungry and vomiting) with normal physiological responses during and after providing

tactile stimulation (sub-statement 6.1.1-6.1.3) whereas the other six could not because the infants had only engagement behaviors with normal physiological responses (Table 9, Appendix E).

However, none of the nurse from every group was able to practice providing appropriate care for infant who was hungry with normal physiological responses during and after providing tactile stimulation (sub-statement 6.2.1), vomited or spitted out with normal physiological responses during and after providing tactile stimulation (sub-statement 6.2.2), had engagement behaviors with abnormal physiological responses during providing tactile stimulation (sub-statement 6.3), had disengagement behaviors with abnormal physiological responses during providing tactile stimulation (sub-statement 6.4) because there was no infant in any group was in those situations during and after providing tactile stimulation. The details are shown in Table 9 (Appendix E).

4.5 Guideline 5: Methods of tactile stimulation

All nurses could practice all of the statements of guideline 5. The details are shown in Table 10 and 11 (Appendix E).

4.6 Problems, limitations, and recommendations of using the CNPG-TS

The NMCU nurse participants identified the problems and limitations of using the CNPG-TS including: 1) forgetfulness of some steps of ATVV (2 participants), and 2) limitation of time for some registered nurses to provide ATVV for preterm infants in the morning shift due to overload of routine work (1 participant).

There was no recommendation to improve the content of the CNPG-TS. However, there were recommendations from the NMCU nurse participants to improve the effectiveness of disseminating and implementing of the CNPG-TS including: 1) the VDO clip for practicing each guideline of the CNPG-TS should be produced to be convenient tool of learning (5 participants); 2) NMCU nurse assistants should be trained to help to provide tactile stimulations for preterm infants in the morning shift, thus every case of preterm infant could receive tactile stimulation (4 participants); 3) more posters about the method of providing GHT and ATVV (guideline 5) should be posted inside the NMCU to solve the problem about forgetfulness of steps of tactile stimulation (4 participants); 4) document of assessment and management of the preterm infant's behavioral and physiological responses (guideline 3 and 4) should be re-organized concisely into a check-list and put in individual flowed-chart of each infant (3 participants); 5) the interesting name of each step of the ATVV should be created for convenient to remember (2 participants); and 6) parents should be trained and involved in providing tactile stimulation for their infant to promote family centered care and maternal-child bonding (2 participants).

Discussion

The findings of this study are discussed and presented as follows: 1) the development of the contents of the CNPG-TS for preterm infants, and 2) the practicability of using the CNPG-TS for preterm infants in NMCU.

The development of the contents of the CNPG-TS for preterm infants

The CNPG-TS was developed based on the development of clinical practice guideline (CPG) of Australian National Health and Medical Research Council (NHMRC, 1998). It is appropriate to use the NHMRC as an organizing framework in this study because it is flexible and practical to modify to suit with the context of workplace. In this study, the NHMRC method was modified into seven steps which were categorized into two phases in concert with suitability of the contexts of the NMCU setting and local staffs. The CNPG-TS development panel who were NMCU nurses had nice cooperation along the study. They arranged each steps of the CNPG-TS developing method to be suitable with their work and time. Thus, they could thoroughly participate in all steps of the study. This response could be supported by Thongchai (2005) which described that flexibility and practicality of the method for developing the CPG/CNPG are important factors those promote cooperation among CNPG developing teams and affect to achievement of development of the CNPG. Polprasit (2009) developed the CNPG for patients being prepared for discharge with central venous catheter by using the method of NHMRC, also supported that the method of NHMRC was flexible and suitable to be used in working with the CNPG-TS development panel in developing the CNPG. There also similar supports in CNPG developmental studies of Srimard (2010), Promlek (2010), and Arttanuchit (2009). In addition, other factors that may affect the achievement of development of the CNPG-TS for preterm infants in this study included a personal factor of nurse participants and an organization factor. The details of each factor are as follows.

1. Personal factor of nurse participants

The CNPG development panel was five registered nurses at NMCU. All of them are over 35 years old which are in the middle adulthood which is the span of age that eager to create environmental and social responsibility by typically more focused in specific directions and having crystallized intelligence which related to skills from accumulated knowledge, mastery of working experience, and good judgment (Sriyannalak, 2009). These results were congruent with the previous studies (Rukkittisakoon, 2006; Srimard, 2010) which also reported that all of their CNPG development panel were middle adulthood. They similarly described that the characteristic of middle adulthood which were eager to create new innovation in workplace might be one of effective factors that affect to achievement of development their CNPG.

Besides, all of the CNPG-TS development panel were professional level nurses who have working experience at NMCU more than 10 years and had previous experience on developmental care training and participation on development or using clinical practice guidelines in their work. Thus, they may have tacit knowledge, mastery of working experience, and good judgment on providing developmental care for preterm infants in NMCU. Their value experience on using and developing clinical practice guideline also may affect their conceptual thinking to concern about appropriateness and practicable contents of the CNPG-TS. The performances of the professional level nurses are independent providing nursing care by using accurate nursing knowledge, creating the working method, having good skill and judgment to provide nursing care and developmental care to preterm infants (Gunilla, Drew,

Dahlberg, & Lutzen, 2002). The experience of the guideline development panel on using or developing any practice guideline is one of important factors that increase their concerning of selecting practicable activities/ evidences for the developed guideline (Scottish Intercollegiate Guidelines Network [SIGN], 2008; Sitthi-amorn, Supachutthikul, Ratanalert, & Ratchaboriruk, 2000). The explanations of personal factor of nurse participants congruent with the previous studies (Arttanuchit, 2009; Polprasit, 2009). Moreover, the feeling of willingness to be participants also leads them to encourage and motivate themselves to direct learning and creating new innovation (Henericson, Susan, & Gesesten, 2008). Therefore, the CNPG-TS development panel was an important source of knowledge for developing the CNPG-TS for preterm infants in this study.

2. Organization factor

The Neonatal Moderate Care Unit (NMCU), Songklanagarind Hospital has identified a 5 year strategic plan to promote developing and using the clinical practice guideline to improve an effectiveness of developmental care for preterm infants in the setting (Neonatal Moderate Care Unit Quality Development Group, 2011). The components of the developed CNPG-TS are related to the organization's policy. Thus, this developmental study was supported and cooperated continuously by the head nurse and all staff nurses along development and evaluation phases, especially in the step of disseminating the CNPG-TS (step 6) and evaluating the practicability of the CNPG-TS (step 7). The CNPG-TS development panel helped organizing multiple strategies to disseminate the CNPG-TS such as mini-poster presentation, sessions of education and discussion for nurse staffs to clarify their

understanding of using the CNPG-TS, and workshop sessions for nurses to practice tactile stimulation. These multiple strategies supported and motivated the researcher and the CNPG-TS development panel to develop the CNPG-TS comfortably and effectively. Sriyannalak (2009) described that organizing an activity for nurse staffs to clarify their understanding about nursing care, will lead to increase knowledge, understanding, concerning, and acceptation to the change, values of improving nursing care. Rukkittisakoon (2006) conducted the study to develop the clinical practice guideline (CPG) for temperature control among preterm infants in incubators by following the policy of the Newborn Unit, Nakornping Hospital to increase quality of care and prepare for Hospital Accreditation (HA). This study was also discussed that supporting factor of organization was important factor to motivate an achievement of the CPG development.

The practicability of using the CNPG-TS for preterm infants in NMCU

According to the result of evaluation process, there were 86 out of 95 statements of the CNPG that had 100% agreement of practicable which was acceptable to be practicable statements follow the criteria of Mason (1994). The criterion of Mason states that at least 90% of practicable agreement was considered acceptable (Mason, 1994). However, nine statements did not meet the criteria of equally or more than 90% of agreement of practicable. Six of nine statements had less than 90% of practicable agreement (2-8 of 10 times) due to no events or situations during implementing the CNPG-TS. The other three statements had 0% of practicable agreement because of no events or situations also. Possible factors related to the practicability of using the CNPG-TS in this study are discussed as follow:

1. Personal factor of nurse participants

The result of the study found that the NMCU nurse participants were able to practice activities to provide tactile stimulation follow the CNPG-TS accurately 100% for 86 statements from 95 statements. There were only 9 statements that the participants were unable to practice at least 9 of 10 times as Mason's criteria because there was limitation of case in the specific conditions during collecting data. Most of items could be practiced probably due to the nurse participants are in the middle adulthood (average age = 37.43 ± 6.41). They are in the age which is high responsibility, eager in working, systemic thinking, and realize the role and mission (Sriyannalak, 2009) which may affect to good participation in using the CNPG-TS. The result was congruent with the study of Urharmnuay, Blackburn, Chotibang, and Woragidpoonpol (2004) which conducted the study related a training program on knowledge and practice regarding development care of neonates among nurses. They described that most of the participants were in middle adulthood (31-55 years old), had systemic thinking and realize the role which might be affect their intention and ability to practice developmental care effectively (Urharmnuay, Blackburn, Chotibang, & Woragidpoonpol, 2004). The result was also congruent with the previous studies (Arttanuchit, 2009; Srimard, 2010) which described that most of the nurse participants were in the middle age were able to be effectively and accurately implement activities following the CNPG.

Moreover, the NMCU nurse participants' average of working experience with hospitalized preterm infants was 15.57 years. According to the Benner's stages of clinical competence (Benner, 1984), nurses who have working experience more than 5 years will be categorized as an expert. Therefore, these nurses may practice the

CNPG-TS effectively. These results were congruent with the previous studies (Arttanuchit, 2009; Rukkittisakoon, 2006) which reported that in order to effectively and accurately implement activities following the CNPG, most of the nurse participants had working experience with target patients more than 5 years.

Although most of nurses did not have previous experience on tactile stimulation or developmental care training, after they attended workshop sessions for preparing knowledge and skill of providing the CNPG-TS, all of them were able to practice the CNPG-TS accurately. Similar to the study of Henericson, Susan, and Gesesten (2008), they said that attending workshop sessions of nurses was good preparation for knowledge and skill to implement appropriate and accurate method of tactile touch to the adult patient in Intensive Care Unit.

2. Organization factor

Similar reason that was mentioned regarding organization factor that may be enhance the development and the success of using the CNPG-TS in the NMCU. Because of the NMCU policy, promoting developmental care to preterm infants became an important nursing care that NMCU nurses must provide effectively. This developmental study was the first study that conducted in NMCU to develop the CNPG-TS with aim to enhance decision making and control the quality of providing developmental care through the effective tactile stimulation to preterm infants. Thus, the head nurse approved and supported the development and implementation of the CNPG-TS as a starting method to promote developmental care in NMCU. There were two major parts of supporting from NMCU ward including 1) equipments for providing tactile stimulation for preterm infant, and 2) learning environment to gain more knowledge and skill to practice the CNPG-TS.

Firstly, the NMCU has adequate equipments to provide tactile stimulation to the preterm infant securely. These following equipments such as portable curtains, dim lights, incubator with covered-clothes, portable radiant warmer, glass thermometer, and pulse oximeter, etc were important to be used to manage appropriate environment for providing tactile stimulation (guideline 2), evaluate and manage a preterm infants readiness before receiving tactile stimulation (guideline 3), and behavioral and physiological responses of preterm infants during and after receiving tactile stimulation (guideline 4). The results showed that no infant had sub-temperature sign or abnormal response of physiological response during and after receiving tactile stimulation. Livingtons et al. (2009) mentioned that, nurse need to prepare necessary medical equipments to assess physiological responses of the preterm infants before, during, and after providing touch or massage intervention in order to observe and prevent abnormal response from the intervention.

Moreover, the result in this study also showed that during receiving tactile stimulation, all of the preterm infants were calm and still. Only some of them had occasionally avertable limbs, stretched limbs, drowsy, frowned or grimace, and eyes closed tight which were possible to occur and recovered when provide appropriate consoling techniques. The current finding was similar to a study of White-Traut, Nelson, Burns, and Cunningham (1994) and Browne (2000) who described that appropriate equipments to reduce external stimuli from light and sound in surrounding environment could reduce disengagement behavioral response of the preterm infant during receiving tactile stimulation. Similarly, a study of Messmer-Talbott, Harrison, Groer, and Younger (2003) indicated that providing Gentle Human Touch to the

preterm infants in dim light and reduced sound environment, the preterm infants were more calm and presented less disengagement behavioral response.

Secondly, there were regular supporting and cooperation from the head nurse and NMCU Quality Development Group to maintain learning environment during dissemination and implementation of the CNPG-TS. Learning environment which was organized and supported by policy and head of workplace is an important component for improving knowledge and practices of staffs (Krairiksh & Anthony, 2001). Evidence-based medicine and clinical practice guidelines committee of the RCPT (2001) also mentioned that organization policy and cooperation from head of work place are necessary to enforce users to learn and practice using the clinical practice guidelines effectively. The supports of organization can help the nurse participants to use the CNPG-TS effectively.

There were four major activities those regularly supported by head nurse and NMCU Quality Development Group including: 1) presenting the CNPG-TS to NMCU nurses during a formal ward meeting, 2) organizing sessions of education and discussion to providing knowledge and practice skill on providing tactile stimulation, 3) arranging academic board for posting the mini-poster of the CNPG-TS, and 4) organizing workshops for NMCU nurses to practice the CNPG-TS. In this study, the NMCU nurse participants learned much of developmental care and tactile stimulation knowledge from education and discussion sessions, workshops, and posters. These were strategies for providing knowledge and skills, sharing knowledge and experience, and encouraging self-directed learning.

The increase in developmental care and tactile stimulation knowledge could enhance the power of the nurses in relation to tactile stimulation practice.

Mrayyan (2006) pointed out that starting to implement new nursing care requires improving the efficiency of nurses. Having a good knowledge and skill of tactile stimulation was a strategy to enhance the NMCU nurse participants' confidence, power, and ability (McKinlay, Coustin, & Cawon, 2001) in providing tactile stimulation in their working routine. By these activities, the NMCU nurse participants stated that they gained more knowledge regarding appropriate tactile stimulation for preterm infants and learned how to implement it in their own routine practice effectively. They actively worked to put tactile stimulation as a part of routine nursing care of NMCU. Although some participant faced limitation of time to provide ATVV for preterm infants in the morning shift due to overload of routine work, but the participant decided to provide ATVV to every preterm infant in other convenient time appropriately. However, there were recommendations from the nurse participants to develop the VDO clip and train the NMCU nurse assistants in order to increase more knowledge and skill for providing tactile stimulation effectively.

There was encouraging regularity of the CNPG-TS practice by peer reminder, electronic nurse's note, and mini-posters of tactile stimulation method. During implementation of the CNPG-TS, the CNPG-TS development panel and head nurse encouraged the NMCU nurse participants to use gentle reminders to remind each other to adhere to tactile stimulation following the CNPG-TS by peer reminder and via electronic nurse's note during giving information of nursing care to nurses in the next shift. The mini-poster which displayed on the board arranged in the NMCU was designed to remind the method of tactile stimulation and remind the NMCU nurse participants to cooperate in using the CNPG-TS. These regularity encouragements supported the nurse participants to practice the CNPG-TS regularly.

The finding was similar to the previous studies (Arttanuchit, 2009; Promlek, 2010; Rukkittisakoon, 2006) which described that regularity encouragements and reminds from peer and head nurse could reinforce nurse participants to use CNPGs regularly.

In addition, Daramas, Chontawan, Yenbut, Wittayasooporn, and Nantachaipan (2008) conducted the study to enhance nursing practice in developmental care for preterm infants described that regularity of practicing will enhance confidence and practicability of providing developmental care. Srimard (2010) also presented that nurse participants in her study mentioned that regularly practices could enhance confidence of decision making and practicability of providing care followed the instruction of the CNPG. Thus by increased knowledge and skill, and regularity encouragements to use the CNPG-TS, the NMCU nurse participants were able to effectively practice tactile stimulation following the CNPG-TS as the result showed that the practicability of using the CNPG-TS which showed 86 statements out of 95 statements were 100% acceptable to be practicable statements.

However, there was practice limitation of a participant's forgetfulness of some steps of ATVV but the participant could provide ATVV to preterm infant accurately after re-read the CNPG-TS. The cause of this limitation may be amount of the details of ATVV and there was only one poster posted on the board. The participants recommended posting more posters and creating the interesting name of each step of the method of providing GHT and ATVV to solve the problem about forgetfulness. This recommendation were similar to suggestions of previous studies (Nordstrom, Bjorvelle, & Krusebrantt, 2007; Srimard, 2010) which described that in order to solve problems of length of the content of practice guideline, learning sources

such as pictures or interesting posters related to the guideline should be presented near nursing station to remind the users for practicing the guideline effectively.

In conclusion, the development and evaluation of the CNPG-TS for preterm infants in NMCU produced favorable results. Overall, the CNPG-TS was acceptable to be practicable statements follow the criteria of Mason (1994). Except nine statements that did not meet the criteria which less than 90% of agreement of practicable because there were limitations of case with sub-temperature, abnormal behavioral and physiological response in actual situations before, during, and after providing tactile stimulation. Thus, the researcher discussed with the CNPG-TS development panel and head nurse on these issues to review the CNPG-TS.

According to discussion, nine statements related to management for the temperature control (e.g. sub-guideline 2.3: statement 5, 6, 7, 16, and 17), provide appropriate care for the infant's behavioral and physiological responses before providing tactile stimulation (guideline 3: statement 2, 5, and 7), and provide appropriate care for infant's behavioral and physiological responses (statement 6, guideline 4) were accepted to be included in the CNPG-TS as optional statements because they are important interventions that need to be considered when providing individualized care for preterm infant that is consistent with the practices of the NMCU. These nine statements will be stated clearly as optional statements to be used when abnormal response occurs. The researcher and the CNPG-TS development panel are reorganizing the disseminating and implementing plan of the CNPG-TS and will submit it to the head nurses for the budget request to develop the VDO clip for practicing and to produce more posters about the methods of providing tactile stimulation. Moreover, the researcher and CNPG-TS development panel have plan to

reorganize format of the final CNPG-TS, construct a check-list to assess and manage the preterm infant's behavioral and physiological responses, and develop teaching plan to train NMCU nurse assistants and parents. The final CNPG-TS and additional documents will be presented to head nurse to be further used as a part of developmental care for preterm infant in the NMCU.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Conclusion

1. The components and activities of the CNPG-TS

This developmental research was conducted to develop the CNPG-TS for preterm infants in the NMCU. The CNPG-TS comprises five guidelines totaling ninety-five statements as follow.

Guideline 1: Criteria to select preterm infants in order to provide appropriate tactile stimulation techniques. This guideline consists of five statements.

Guideline 2: Appropriate environmental management to provide tactile stimulation to preterm infants. This guideline comprises three sub-guidelines including sub-guideline 2.1 sound management consists of fifteen statements; sub-guideline 2.2 light management consists of three statements; and sub-guideline 2.3 temperature control consists of eighteen statements.

Guideline 3: Evaluating a preterm infant's readiness and management before receiving tactile stimulation. This guideline consists of seven statements.

Guideline 4: Evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile stimulation and management. This guideline consists of six statements.

Guideline 5: Methods of tactile stimulation. This guideline consists of two sub-guidelines including; sub-guideline 5.1 method of Gentle Human Touch (GHT) comprising seventeen statements, and sub-guideline 5.2 method of Multisensory

Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) comprising twenty-four statements.

2. The practicability of nurses in using the CNPG-TS for preterm infants in NMCU

Basing the CNPG-TS evaluation on Mason (1994), the NMCU nurse participants were able to practice accurately 100% of 86 statements from the total of 95 statements of the CNPG-TS. There were nine statements NMCU nurses were unable to practice equal or more than 9 of 10 times (or ≥ 90%) because there were no events or situations while collecting data. However, these 9 statements were still included in the CNPG-TS as optional statements because they are necessary components of developmental intervention.

In addition, the NMCU nurse participants identified the problems and limitations of using the CNPG-TS including 1) limitation of times due to work load, and 2) forgetfulness of some steps of the ATVV. There were no recommendations as to how to improve the content of the CNPG-TS. However, there were recommendations to improve the effectiveness of disseminating and implementing the CNPG-TS including 1) developing a VDO clip for demonstrating the CNPG-TS; 2) training NMCU nurse assistants in providing tactile stimulation; 3) posting posters about the methods of providing GHT and ATVV; 4) creating a memorable name of each step of the ATVV; 5) developing a concise check-list assessment and management of the preterm infant's behavioral and physiological responses; and 6) training parents in providing tactile stimulation.

Strength of the Study

The CNPG-TS was developed according to the NMCU ward's policy and was established as project plan of this ward. For this reason, the study had good cooperation from the head nurse and all nurses in organizing time and budget for panels meetings, workshop activities, and focus group discussions to develop an appropriate and practicable CNPG-TS.

Implications

This CNPG-TS can be used as guidance for NMCU nurses to provide and advise parents to promote preterm infant growth and development.

Recommendations

The findings of this study provide recommendations to improve the CNPG-TS as follows:

1. Before implementation the CNPG-TS, users and organizations should be prepared to augment their knowledge, skills, and the context of their working routine to use the CNPG-TS appropriately.

2. After implementation, the CNPG-TS should be regularly evaluated for practicability and effectiveness by users (e.g. every 3 to 6 months). Thus, the results of the evaluation will be used to refine and improve the quality and appropriateness of the CNPG-TS.

3. Future research should be conducted to examine the effectiveness of the CNPG-TS on preterm infant's development and outcome such as sleep-wake pattern, readiness of feeding, state organization, and weight gain.

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APPENDICES

Appendix A

The Clinical Nursing Practice Guideline of Tactile Stimulation (CNPG-TS) for Preterm Infants in NMCU, Songklanagarind Hospital

The CNPG-TS Development Panels

1. Miss Natthaya Cherngchalard
   BSN. (Nursing)
   Master student of Pediatric Nursing, Faculty of Nursing, Prince of Songkla University
2. Mrs. Kannika Ausnangkornchai
   BSN. (Nursing)
   Head nurse of NICU, Songklanagarind Hospital
3. Miss Patcharee Chairerk
   MSN. (Administrative nursing)
   Neonatal nurse practitioner
   Registered nurse, Songklanagarind Hospital
4. Miss Mayuree Petchkong
   MSN. (Pediatric Nursing)
   Neonatal nurse practitioner
   Registered nurse, Songklanagarind Hospital
5. Mrs. Achara Chinnawon
   BSN. (Nursing)
   Neonatal nurse practitioner
   Registered nurse, Songklanagarind Hospital
6. Mrs. Kasminee Yusoh
   BSN. (Nursing)
   Neonatal nurse practitioner
   Registered nurse, Songklanagarind Hospital

Advisor committee

1. Asst. Prof Dr. Kaitsara Sen-ngam
   Ph. D. (Nursing)
   Department of Maternal and Child Nursing, School of Nursing, Rangsit University
2. Asst. Prof Dr. Busakorn Punthmatharith
   Ph. D. (Nursing)
   Department of Pediatric Nursing, Faculty of Nursing, Prince of Songkla University

The purposes of the CNPG-TS

NMCU nurses can use the CNPG-TS as a guideline to make decision to provide appropriate and safety tactile stimulation for preterm infants in the NMCU.

The target audiences for the CNPG-TS

1) The users are registered nurses who work and involve in providing care for preterm infants admitted in the NMCU, Songklanagarind Hospital.

2) The target population is medically stable preterm infants who are admitted in the NMCU, Songklanagarind Hospital.

The expected short-term outcomes of the CNPG-TS

To be a feasible CNPG for nurse to provide appropriate, safety, and accurate tactile stimulation for preterm infants in NMCU.

The content of the CNPG-TS for preterm infants in NMCU, Songklanagarind Hospital

The CNPG-TS for preterm infants in NMCU, Songklanagarind Hospital is an evidence-based clinical nursing practice guideline. This CNPG was developed by using the modified method of a guide of the development clinical practice guideline (CPG) of Australian National Health and Medical Research Council (NHMRC, 1998).

The component of the CNPG-TS consisted of five guidelines, five sub-guidelines with ninety-five statements as follows.

Guideline 1: Criteria to select preterm infants for providing appropriate tactile stimulation techniques (5 statements)

Guideline 2: Appropriate environmental management for providing tactile stimulation to preterm infants

Sub-guideline 3.1 Sound management (15 statements)

Sub-guideline 3.2 Light management (3 statements)

Sub-guideline 3.3 Temperature control (18 statements)

Guideline 3: Evaluating a preterm infants readiness and management before receiving tactile stimulation (7statements)

Guideline 4: Evaluating the behavioral and physiological responses of preterm infants during and after receiving tactile stimulation and management (6 statements)

Guideline 5: Methods of tactile stimulation

Sub-guideline 5.1 Method of Gentle Human Touch (GHT) (17 statements)

Sub-guideline 5.2 Method of Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) (24 statements)

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23. Evaluate behavioral and physiological responses after GHT (please follow guideline 4, page 29).
24. Place an infant to relax for 10 minutes.

Appendix B
Nurse's Practicability Questionnaire

No_____

Date_____

Instruction: The Nurse's Practicability Questionnaire is categorized into 4 parts as follows:

Part 1 Demographic Characteristic Questionnaire

Section 1 Demographic Characteristics of NMCU nurses

Section 2 Demographic Characteristics of preterm infants

Part 2 Recording Form of the Preterm Infant's Behavioral and Physiological Responses

Part 3 Recording Form of the Nurse's Practices on the CNPG-TS for Preterm infants in NMCU

Part 4 Problems, Limitations, and Recommendation of Using the CNPG-TS Questionnaire

Part 1 Demographic Characteristic Questionnaire

Instruction: Please check √ in ( ) that corresponds to your answer, or write your answer in the blank where appropriate. (Please answer all of the following questions)

Section 1 Demographic Characteristics of NMCU Nurses

1. Age……..years
2. Education level

   ( ) Bachelor's degree ( ) Master's degree
3. Working duration in NMCU……years
4. Previous experience/training on tactile stimulation or developmental care

   ( ) Yes (Please specify the topic……)

   ( ) No
5. Previous participation in developing or using any clinical practice guidelines for preterm infant care

   ( ) Yes (Please specify the topic……)

   ( ) No

Section 2 Demographic Characteristics of Preterm Infant

1. Gender ( ) Male ( ) Female
2. Gestational age……. weeks (assessed by Ballard score)
3. Current age when received tactile stimulation……days
4. Current body weight.....grams
5. Type of tactile stimulation (Please select only 1 true answer)

   ( ) Gentle Human Touch (GHT)

   ( ) Multisensory stimulation: Auditory, Tactile, Visual, & Vestibular (ATVV)

6. Duration of receiving tactile stimulation from……...am./pm. to…… am./pm (total……minutes)
7. Current clinical signs or diagnoses (Can select more than one answer)

( )	Stable	( )	Apnea
( )	Respiratory distress syndrome	( )	Bronchopulmonary dysplasia
( )	Severe birth asphyxia	( )	Normal oxygen saturation (88-100 % in healthy preterm infant or > 82-88% in preterm infant with BPD)
( )	Postoperative period less than 3 days/ wet surgical wound/ risk for infected wound	( )	Omphalocele/ Gastroschisis/ abdominal and chest wound
( )	Myelomeningocole/ meningocoele	( )	Sub temperature
( )	Neonatal seizure	( )	Severe neonatal sepsis
( )	Intraventricular hemorrhage	( )	Hyperbilirubinemia with phototherapy
( )	Contagious skin diseases	( )	Visual disorders
( )	Congenital heart disease	( )	Congestive heart failure
( )	Necrotinizing enterocolitis	( )	Esophageal reflux
( )	Hypoglycemia	( )	Other (please specify).....

8. Current treatments (Can select more than one answer)

( ) Crib

( ) Incubator

Please specify

( ) Air servo control mode

( ) Skin servo control mode

( ) Endotracheal tube

( ) Oxygen box

( ) Oxygen flow in an incubator

( ) Nasal CPAP

( ) Nasal prongs

( ) Central intravenous infusion

( ) Umbilical arterial catheter or Umbilical venous catheter

( ) Peripheral intravenous infusion

( ) Blood transfusion

( ) Phototherapy

( ) Enteral feeding

Please specify the duration of performing tactile stimulation after feeding

( ) Less than 30 minutes

( ) More than 30 minutes

( ) Other (please specify).....

Part 2 Recording Form of the Preterm Infant's Behavioral and Physiological Responses

Instruction: Please check √ in ( ) that corresponds to your answer, or write your answer in the blank where appropriate. (Please answer all of the following questions)

1. The preterm infant's characteristics ***before*** receiving tactile stimulation

   1.1 Axillary temperature ……..°C

   1.2 The preterm infant's state of consciousness (Please select only 1 true answer)

   ( ) Quiet sleep ( ) Active sleep ( ) Drowsy

   ( ) Quiet alert ( ) Active alert ( ) Cry

   1.3 Heart rate…….beats per minute, characteristics……..

   1.4 Respiratory rate……breaths per minute, characteristics…… …

   1.5 Oxygen saturation level (O_2sat)……%

   1.6 Behavioral responses (Can select more than one answer)

( )	Quite alert	( )	Crying or fussing
( )	Calm and still	( )	Frustrated
( )	Wide and bright eyes	( )	Frowned or grimace
( )	Focused attention on stimuli	( )	Eyes closed tight
( )	Smooth and gentle motor movement	( )	Avertable the gaze
( )	Opened palms	( )	Stretched limbs
( )	Gentle movement of fingers and slightly flex fingers	( )	Stretched palms
( )	Stretched fingers	( )	Jittery or jerky movements
( )	Yawning	( )	Hungry
( )	Spit out	( )	Vomiting
( )	Other (Please specify).....		

2. The preterm infant's characteristics ***during*** receiving tactile stimulation

(Please answer questions 2.1-2.5 after finishing tactile stimulation)

2.1 Behavioral responses (Can select more than one answer)

( )	Quite alert	( )	Crying or fussing
( )	Calm and still	( )	Frustrated
( )	Wide and bright eyes	( )	Frowned or grimace
( )	Focused attention on stimuli	( )	Eyes closed tight
( )	Smooth and gentle motor movement	( )	Avertable the gaze
( )	Opened palms	( )	Stretched limbs
( )	Gentle movement of fingers and slightly flex fingers	( )	Stretched palms
( )	Stretched fingers	( )	Jittery or jerky movements
( )	Yawning	( )	Hungry
( )	Spit out	( )	Vomiting
( )	Other (Please specify).....		

2.2 Heart rate (HR) and characteristics (Can select more than one answer)

( )	120-160 beats/minute	( )	< 100 or > 180 beats/ minute
( )	Increased HR no more than 20% of baseline value	( )	Increased HR more than 20% of baseline value
( )	Decreased HR no more than 20% of baseline value	( )	Continuously decreased HR and oxygen saturation < 88%
( )	Regular rate		
( )	Other (please specify).....		

2.3 Respiratory rate (RR) and characteristics (Can select more than one answer)

( ) 30-60 breaths per minute
( ) <30 or >60 breaths /minute
( ) Regular RR or increased RR no more than 20% of baseline value
( ) Increased RR more than 20% of baseline value
( ) No decreased RR
( ) Decreased RR with oxygen saturation < 88%
( ) No respiratory distress
( ) Respiratory distress
( ) No apnea
( ) Apnea
( ) Other (please specify).....

2.4 Oxygen saturation level (Can select more than one answer)

( ) 88-100% (healthy infant)
( ) Continuously decreased
( ) > 82-88% (BPD infant, ***only GHT***)
( ) < 82% (BPD infant, ***only GHT***)
( ) Decreased no more than 2%
( ) Decreased more than 2%
( ) No continuously decreased
( ) < 88% (healthy infant)
( ) Other (Please specify).....

2.5 Sub-temperature signs (Can select more than one answer)

( ) No signs
( ) Cold skin
( ) Pale or cyanosis appearance
( ) Lethargy
( ) Mottled skin
( ) Hypotonic muscle
( ) Other (Please specify).....

3. The preterm infant's characteristics ***after*** receiving tactile stimulation

(Please answer questions 3.1-3.4 after finishing tactile stimulation)

3.1 Axillary temperature ……..℃

3.2 Behavioral responses (Can select more than one answer)

( ) Quite alert	( ) Crying or fussing
( ) Calm and still	( ) Frustrated
( ) Wide and bright eyes	( ) Frowned or grimace
( ) Focused attention on stimuli	( ) Eyes closed tight
( ) Smooth and gentle motor movement	( ) Avertable the gaze
( ) Opened palms	( ) Stretched limbs
( ) Gentle movement of fingers and slightly flex fingers	( ) Stretched palms
( ) Stretched fingers	( ) Jittery or jerky movements
( ) Yawning	( ) Hungry
( ) Spit out	( ) Vomiting

( ) Other (Please specify).....

3.3 Heart rate (HR) and characteristics (Can select more than one answer)

( ) 120-160 beats/minute	( ) < 100 or > 180 beats/ minute
( ) Increased HR no more than 20% of baseline value	( ) Increased HR more than 20% of baseline value
( ) Decreased HR no more than 20% of baseline value	( ) Continuously decreased HR and oxygen saturation < 88%
( ) Regular rate	

( ) Other (please specify).....

3.4 Respiratory rate (RR) and characteristics (Can select more than one answer)

( )	30-60 breaths per minute	( )	<30 or >60 breaths /minute
( )	Regular RR or increased RR no more than 20% of baseline value	( )	Increased RR more than 20% of baseline value
( )	No decreased rate	( )	Decreased RR with oxygen saturation < 88%
( )	No respiratory distress	( )	Respiratory distress
( )	No apnea	( )	Apnea
( )	Other (please specify).....		

3.5 Oxygen saturation level (Can select more than one answer)

( )	88-100% (healthy infant)	( )	< 88% (healthy infant)
( )	> 82-88% (BPD infant, ***only GHT***)	( )	< 82% (BPD infant, ***only GHT***)
( )	Decreased no more than 2%	( )	Decreased more than 2%
( )	No continuously decreased	( )	Continuously decreased
( )	Other (Please specify).....		

Part 3 Recording Form of the Nurse's Practices on the CNPG-TS for Preterm infants in NMCU

Instruction: Please check √ in ( ) that corresponds to your answer, or write your answer in the blank where appropriate. (Please answer all of the following questions)

Explanations for scoring

Practicable	means	able to practice the statement of the CNPG-TS for preterm infant. The score is 1 point for each statement.
Impracticable	means	unable to practice the statement of the CNPG-TS for preterm infant. Please notify the reason. The score is 0 point for each statement.
Not practice	means	did not practice or did not have a chance to practice the statement of the CNPG-TS for preterm infant. Please notify the reason. The score is 0 point for each statement.

Part 3 (Continued)

Guideline	Practicable	Impracticable	Not practice	Please notify the reason if impracticable or not practice
Guideline 1 Criteria to select preterm infants for providing appropriate tactile stimulation techniques Before providing tactile stimulation, you assessed the selection criteria for a preterm infant: 1. Gestational age				
2. Current body weight				
. . . **Guideline 5 Methods of tactile stimulation** **<u>(Please select only 1 sub-guideline from sub-guidelines 5.1 and 5.2 that appropriate to the tactile stimulation method that you provide to the infant)</u>** **Sub-guideline 5.1 Method of Gentle Human Touch (GHT)** 1. Provide GHT in appropriate time as follows: 1.1 When a preterm infant is in a drowsy, quite alert, or active alert state				
1.2 10-15 minutes for each time				
1.3 At least 3 times a day before or after feeding more than 30 minutes				

Part 3 (Continued)

Guideline	Practicable	Impracticable	Not practice	Please notify the reason if impracticable or not practice
. . .				
5.2 Method of Multisensory stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) 1. Provide ATVV in appropriate time as follows: 1.1 When preterm infant is in quite alert or active alert state				
1.2 15 minutes for each time				
. . . 22. Swaddle an infant when finishing ATVV.				
23. Evaluate behavioral and physiological responses after GHT (please follow guideline 4, page 23).				
24. Place an infant to relax for 10 minutes.				

Part 4 Problems, Limitations, and Recommendation of Using the CNPG-TS Questionnaire

Instruction: Please write your opinion in the blank where appropriate. (Please answer all of the following questions)

1. What is (are) the problem(s) or limitation(s) did you encounter while using the CNPG-TS for preterm infant?

_____
_____
_____
_____
_____
_____
_____
_____
_____

2. What is your suggestion to improve the CNPG-TS for preterm infant to be more effective for nursing practice?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

APPENDIX C

Informed Consent Form for NMCU Nurse Participants

My name is Natthaya Cherngchalard, I am a Master student of the Pediatric Nursing (International Program), Faculty of Nursing, Prince of Songkla University. I am conducting a study entitled "Development and Evaluation of Clinical Nursing Practice Guideline of Tactile Stimulation for Preterm Infants in the Neonatal Moderate Care Unit". This study is conducted under supervision of Asst. Prof. Dr. Kaitsara Sen-ngam (major advisor) and Asst. Prof. Dr. Busakorn Punthmatharith (co-advisor). This developmental study is aim to develop and evaluate the Clinical Nursing Practice Guideline of Tactile Stimulation (CNPG-TS) for preterm infants in the Neonatal Moderate Care Unit (NMCU). The study has been approved by Institutional Review Board (IRB) of Faculty of Nursing and Faculty of Medicine, Prince of Songkla University. Your participation will provide valuable information to nurses on providing tactile stimulation to preterm infants in the NMCU. If you agree to participate in the study, you will be asked to participate in 1) at least 1 session of 3 hour-workshop to clarify and practice providing tactile stimulation follow the CNPG-TS; 2) provide both types of tactile stimulation (Gentle Human Touch and Multisensory Stimulation) at least one time each to selected preterm infants during working routine, the tactile stimulation method may take about 10-15 minutes; and 3) complete the Nurse's Practicability Questionnaire when finished tactile stimulation in each case of preterm infant, the questionnaires will take approximately 30 minutes to complete the questionnaire.

Your participation in this study is voluntary. You have the right to participate or withdraw from this study at any time. Whether, you participate or not, there will be not any consequence on your career or your personal life. Your information will be kept confidential. The results of this study will be published as group data, and no one will be able to identify your personally in the report. Your signature below indicated that you agree to participate in this study.

If you have any question about the study, you can directly contact me by phone number 082-4284247 or by e-mail natty_nurse@hotmail.com. You will receive a copy of this informed consent.

Thank you for your cooperation.

Natthaya Cherngchalard

For Participants

I am (Mr./Mrs./Miss) (name)……(surname)…… willing to participate in this study.

If I have any suspect about this study, I have right to ask any question from the researcher. If the explanation from the researcher is unpleasant, I have right to inform the Chairman of the Ethics in Human Research (Dean of Faculty of Medicine, Tel. 074-451100) or the director of Songklanagarind hospital (Tel. 074-451010). I also have the right to withdraw my participation at any time during the study without any consequence on my career.

I was informed and understand all information according to the study and agree to participate in this study.

……	……
(Signature of Participant)	(Date/Month/Year)
……	……
(Signature of Researcher)	(Date/Month/Year)
……	……
(Signature of Witness)	(Date/Month/Year)

APPENDIX D

Informed Consent Form for Parents of Preterm Infants

My name is Natthaya Cherngchalard, I am a Master student of the Pediatric Nursing (International Program), Faculty of Nursing, Prince of Songkla University. I am conducting a study entitled "Development and Evaluation of Clinical Nursing Practice Guideline of Tactile Stimulation for Preterm Infants in the Neonatal Moderate Care Unit". This study is conducted under supervision of Asst. Prof. Dr. Kaitsara Sen-ngam (major advisor) and Asst. Prof. Dr. Busakorn Punthmatharith (co-advisor). This developmental study is aim to develop and evaluate the Clinical Nursing Practice Guideline of Tactile Stimulation (CNPG-TS) for preterm infants in the Neonatal Moderate Care Unit (NMCU). The study has been approved by Institutional Review Board (IRB) of Faculty of Nursing and Faculty of Medicine, Prince of Songkla University. Your participation will provide valuable information to nurses on providing tactile stimulation to preterm infants in the NMCU.

The researcher would like to have the permission from you to allow your infant to participate in this study. Your infant will be provided tactile stimulation by the NMCU nurses follow instruction in the developed CNPG-TS. Your infant will be provided 1 type of these 2 types of tactile stimulation which are 1) Gentle Human Touch (GHT) which is a type of tactile stimulation that using palm of hands place on two positions of a infant's skin (head and abdomen, or head and buttocks) still and gentle at the same time for 10-15 minutes, everyday, 3 times a day, before or after feeding more than 30 minutes; or 2) Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) which is a type of stimulation that stimulate 4 sensory of a preterm infant including 1) auditory using soft talking, 2) tactile using palm of hands caress on infant's skin, 3) visual using eye contact, and 4) vestibular using rocking. The ATVV will provide for15 minutes, everyday, 2 times a day, before or after feeding more than 30 minutes.

Both types of tactile stimulation will not use any equipment with your infant. Tactile stimulation is not harmful or painful to your infant. According to previous study, these types of tactile stimulation did not have disadvantage to preterm infants. However, during providing the tactile stimulation to your infant, the NMCU nurse will closely observed the signs of distress and clinical conditions of your infant. If the

infant presented any signs of distress or clinical changes, the nurses must stop providing tactile stimulation immediately, and provided appropriate consolation and care until the infant was calm and stable.

Your permission for your infant to participate in this study is voluntary. You have the right to permit or not permit. Whether, you permit or not, there will be not any consequence on your infant's treatment and care. Your information will be kept confidential. The results of this study will be published as group data, and no one will be able to identify your personally in the report. Your signature below indicated that you agree to permit your infant to participate in this study. If you have any question about the study, you can directly contact me by phone number 082-4284247 or by e-mail natty_nurse@hotmail.com. You will receive a copy of this informed consent.

Thank you for your cooperation.

Natthaya Cherngchalard

For Participants

I am (Mr./Mrs./Miss) (name)……(surname)……..……
The parent of (Mr./Ms.) (your infant's name and surname).....
permit (Mr./Ms.) (your infant's name and surname).....
to participate in this study.

If I have any suspect about this study, I have right to ask any question from the researcher. If the explanation from the researcher is unpleasant, I have right to inform the Chairman of the Ethics in Human Research (Dean of Faculty of Medicine, Tel. 074-451100) or the director of Songklanagarind hospital (Tel. 074-451010). I also have the right to withdraw my permission for my infant's participation at any time during the study without any consequence on my infant's care and treatment.

I was informed and understand all information according to the study and agree to participate in this study.

……	……
(Signature of Parent)	(Date/Month/Year)
……	……
(Signature of Researcher)	(Date/Month/Year)
……	……
(Signature of Witness)	(Date/Month/Year)

APPENDIX E

Additional Results

Table 6

Frequency and percentage of the nurses' practicability of using each statement of the guideline 1: Criteria to select preterm infant for providing appropriate tactile stimulation techniques (n = 10/group)

The CNPG statements	Group 1				Group 2				Group 3				Group 4			
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
1. Assess gestational age	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
2. Assess current age	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
3. Assess current body weight of preterm Infant	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
4. Assess current clinical signs or diagnoses	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5. Assess current treatments																
5.1 Type of oxygen therapy	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5.2 Intravenous catheter	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5.3 Umbilical catheter	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5.4 Blood transfusion	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5.5 Phototherapy	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0
5.6 Enteral feeding	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0

Table 7

Frequency and percentage of the nurses' practicability of using each statement of the guideline 2: Appropriate environmental management for providing tactile stimulation to preterm infants (n = 10/group)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
Sub-guideline 2.1 Sound management																	
1. Do not move a crib or incubator.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2. Use a portable curtain or an incubator cover-cloth.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3. Put a sign "Please decrease sound/ quiet".	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4. Close the door tightly to prevent sound from outside.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
5. Open-close incubator's windows gently.	10	100	0	0	10	100	0	0	0*	0	10	100	0*	0	10	100	*No infant in group 3 and 4 was in an incubator
6. Immediately stop alarm sound.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
7. Assess sources of loud sound.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
8. Immediately manage the source of alarm sound.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
9. Avoid speaking with loud and high pitched tone nearby a crib or incubator.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
10. Turn down or turn off nearby radios or speakers	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
11. Mute a mobile phone.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
12. Decrease a telephone sound, keep at a level that nurses can hear.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
13. Pick up and put down any equipments gently including closing the garbage can.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
14. Avoid placing any equipments on the top of an incubator.	10	100	0	0	10	100	0	0	0*	0	10	100	0*	0	10	100	*No infant in group 3 and 4 was in an incubator
15. Talk with the infant using calm and soothing voice during stimulation.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
Sub-guideline 2.2 Light management																	
1. Close the windows with opaque curtains.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2. Use dim lights or reduce light levels, maintaining a light level for accurate clinical observation.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3. Use appropriate material to protect the light																	
3.1 If an infant is in a crib, use a portable curtain to protect the light.	0*	0	10	100	0*	0	10	100	10	100	0	0	10	100	0	0	*No infant in group 1 and 2 was in a crib
3.2 If an infant is in an incubator, cover the top of an incubator with a cover-cloth, and partially open only the front so a nurse can make eye contact with an infant during stimulation.	10	100	0	0	10	100	0	0	0*	0	10	100	0*	0	10	100	*No infant in group 3 and 4 was in an incubator

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
Sub-guideline 2.3 Temperature control																	
1. Record room temperature before stimulation.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2. Record incubator temperature before stimulation.	10	100	0	0	10	100	0	0	0*	0	10	100	0*	0	10	100	*No infant in group 3 and 4 was in an incubator
3. Take axillary temperature by placing a glass thermometer at the middle of an axilla for 5 minutes.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4. Observe signs of sub-temperature before stimulation such as cold skin, pale or cyanosis, irregular respiration, lethargy, apnea, and hypotonic muscle.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
5. Provide appropriate temperature control for an infant who has normal body temperature (36.8-37.2^{0}C) before receiving tactile stimulation based on the following topics 5.1-5.3																	
5.1 The infant is *in a crib*, can provide tactile stimulation.	0*	0	10	100	0*	0	10	100	10	100	0	0	10	100	0	0	*No infant in group 1 and 2 was in a crib

Table C6 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
5.2 The infant is *in an incubator with an air servo control mode*,																	
5.2.1 The infant received GHT, can provide GHT via the incubator's windows.	6*	60	4	40	0**	0	10	100	0**	0	10	100	0**	0	10	100	* The other 4 infants were in an incubator with a skin servo control mode. ** No infant in group 2,3, and 4 was in an incubator and
5.2.2 The infant received ATVV,																	
5.2.2.1 Take an infant out of an incubator and place the infant on a nurse's laps or in a crib.	0**	0	10	100	8*	80	2	20	0**	0	10	100	0**	0	10	100	* The other 2 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV
5.2.2.2 Provide ATVV under a portable radiant warmer.	0**	0	10	100	8*	80	2	20	0**	0	10	100	0**	0	10	100	* The other 2 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
5.3 The infant is *in an incubator with a skin servo control mode*,																	
5.3.1 The infant received GHT, can provide GHT via an incubator's windows and do not take off a skin probe.	4*	0	6	60	0**	0	10	100	0**	0	10	100	0**	0	10	100	* The other 6 infants were in an incubator with an air servo control mode. ** No infant in group 2,3, and 4 was in an incubator and received GHT
5.3.2 The infant received ATVV,																	
5.3.2.1 Switch a skin servo control mode to an air servo control mode and set air temperature equals to previous skin temperature.	0**	0	10	100	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 8 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV
5.3.2.2 Take off a skin probe.	0**	0	10	100	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 8 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
5.3.2.3 Take an infant out of an incubator, place the infant on a nurse's laps or in a crib	0**	0	10	100	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 8 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV
5.3.2.4 Provide ATVV under a portable radiant warmer.	0**	0	10	100	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 8 infants were in an incubator with a skin servo control mode. ** No infant in group 1,3, and 4 was in an incubator and received ATVV
6. Provide appropriate temperature control for an infant who has sub-temperature (<36.8 ^{0}C) before receiving tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	*No infant in any group had sub-temperature before receiving tactile stimulation
7. Provide appropriate temperature control for an infant who has high body temperature (>37.2^{0}C) before receiving tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	*No infant in any group had high body temperature before receiving tactile stimulation

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
8. Set air-conditioner temperature at 27-28 ^{0}C.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
9. Adjust air from an air-conditioner, not blow directly to an infant.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
10. Close all doors, windows and curtains to prevent the sun-light.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
11. Place an incubator or a crib far a wall at least 2 feet.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
12. Put an infant to sleep at the area that has no wind, no fan, no air-conditioner, or no sun-light.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
13. Keep warm all equipments before using with the infant																	
13.1 Warm cloths and diapers in an incubator.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
13.2 Rub dry and clean hands before touching the infant.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
14. Observe signs of sub-temperature *during* stimulation such as cold skin, pale or cyanosis, irregular respiration, lethargy, apnea, and hypotonic muscle.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
15. Provide appropriate temperature management for an infant who has signs of sub-temperature.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
16. If found the infant defecate or urinate																	
16.1 Clean up and wipe dry Immediately	8*	80	2	20	4*	40	6	60	10	100	0	0	7*	70	3	30	* The other 2, 6, and 3 infants in group 1, 2, and 4, respectively did not defecate or urinate during providing tactile stimulation
16.2 Put on a clean and warm diaper.	8*	80	2	20	4*	40	6	60	10	100	0	0	7*	70	3	30	* The other 2, 6, and 3 infants in group 1, 2, and 4, respectively did not defecate or urinate during providing tactile stimulation

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
17. Keep warm the infant immediately after finishing tactile stimulation based on the following three topics: topic 17.1-17.3																	
17.1 The infant is *in a crib*																	
17.1.1 Swaddle an infant.	0*	0	10	100	0*	0	10	100	10	100	0	0	10	100	0	0	*No infant in group 1 and 2 was in a crib
17.1.2 Put on an infant's hat.	0*	0	10	100	0*	0	10	100	10	100	0	0	10	100	0	0	*No infant in group 1 and 2 was in a crib
17.1.3 Cover an infant with a warm blanket.	0*	0	10	100	0*	0	10	100	10	100	0	0	10	100	0	0	*No infant in group 1 and 2 was in a crib
17.2 The infant is *in an incubator with an air servo control mode*																	
17.2.1 Put on an infant's hat.	6*	60	4	40	8*	80	2	20	0**	0	10	100	0**	0	10	100	* The other 4 and 2 infants in group 1 and 2, respectively were in an incubator with a skin servo control mode. ** No infant in group 3 and 4 was in an incubator

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
17.2.2 Adjust the incubator's setting appropriately.	6*	60	4	40	8*	80	2	20	0**	0	10	100	0**	0	10	100	* The other 4 and 2 infants in group 1 and 2, respectively were in an incubator With a skin servo control mode. ** No infant in group 3 and 4 was in an incubator
17.2.3 Place the infant in a nest in a comfortable position.	6*	60	4	40	8*	80	2	20	0**	0	10	100	0**	0	10	100	* The other 4 and 2 infants in group 1 and 2, respectively were in an incubator With a skin servo control mode. ** No infant in group 3 and 4 was in an incubator
17.3 The infant is *in an incubator with a skin servo control mode*																	
17.3.1 Put on an infant's hat.	4*	40	6	60	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 6 and 8 infants in group 1 and 2, respectively were in an incubator with an air servo control mode. ** No infant in group 3 and 4 was in an incubator

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
17.3.2 Place a skin probe back.	4*	40	6	60	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 6 and 8 infants in group 1 and 2, respectively were in an incubator with an air servo control mode. ** No infant in group3 and 4 was in an incubator
17.3.3 Switch a skin servo control mode to an air servo control mode.	4*	40	6	60	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 6 and 8 infants in group 1 and 2, respectively were in an incubator with an air servo control mode. ** No infant in group3 and 4 was in an incubator
17.3.4 Set air temperature equals to previous skin temperature.	4*	40	6	60	2*	20	8	80	0**	0	10	100	0**	0	10	100	* The other 6 and 8 infants in group 1 and 2, respectively were in an incubator with an air servo control mode. ** No infant in group3 and 4 was in an incubator

Table 7 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
18. Re-evaluate an infant's axillary temperature and sub-temperature signs after finishing tactile stimulation.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 8

Frequency and percentage of the nurses' practicability of using each statement of the guideline 3: Evaluating a preterm infants readiness and management before receiving tactile stimulation (n = 10/group)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
1. Evaluate the infant's state of consciousness.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2. Provide appropriate care for the infant in each state of consciousness based on the following four topics: topic 2.1-2.3																	
2.1 Quiet or active sleep states																	
2.1.1 Do not disturb.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	*No infant in any group was in state of sleep
2.1.2 Postpone tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	*No infant in any group was in state of sleep
2.2 Drowsy state																	
2.2.1 Gradually wake the infant until get into a quite alert state.	4*	40	6	60	2*	20	8	80	5*	50	5	50	0*	0	10	100	* The other 6, 8, 5, and 10 infants in group 1, 2, 3, and 4, respectively were in state of quite alert.

Table 8 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
2.2.2 Assess the infant's physiological responses for consideration to provide further tactile stimulation.	4*	40	6	60	2*	20	8	80	5*	50	5	50	0*	0	10	100	* The other 6, 8, 5, and 10 infants in group 1, 2, 3, and 4, respectively were in state of quite alert.
2.3 Quite alert or active alert states, assess the infant's physiological responses for consideration to provide tactile stimulation.	6*	60	4	40	8*	80	2	20	5*	50	5	50	10	100	0	0	* The other 4, 2, and 5 infants in group 1, 2, and 3, respectively were in state of drowsy.
2.4 Crying state																	
2.4.1 Console the infant appropriately.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group was in state of crying
2.4.2 Determine for possible causes.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group was in state of crying
2.4.3 Postpone tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group was in state of crying

Table 8 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
3. Evaluate the infant's physiological responses																	
3.1 Evaluate heart rate and its characteristic with a stethoscope for 1 minute.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3.2 Evaluate respiratory rate and its characteristic for 1 minute.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3.3 Evaluate oxygen saturation by using a pulse oximeter.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4. Interpret the results of The infant's physiological responses.																	
4.1 Heart rate and its characteristic	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4.2 Respiratory rate and its characteristic	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4.3 Oxygen saturation	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 8 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
5. Provide appropriate care when the infant has abnormal physiological responses.																	
5.1 Determine for possible causes.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group had abnormal physiological responses
5.2 Provide care.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group had abnormal physiological responses
5.3 Postpone tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group had abnormal physiological responses
6. If the infant has normal physiological responses, evaluate the infant's behavioral responses (engagement behaviors).																	
6.1 Evaluate for the infant's engagement behaviors	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 8 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
6.2 Evaluate for the infant's disengagement behaviors	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
7. Provide appropriate care for infant's behavioral responses based on the following two topics: topic 7.1-7.2																	
7.1 If the infant has only engagement behaviors, start tactile stimulation.	7*	70	3	30	8*	80	2	20	10	100	0	0	5*	50	5	50	* The other 3, 2, and 5 infants in group 1, 2, and 4 , respectively had at least 1 disengagement behavior.
7.2 If the infant has at least 1 disengagement behaviors,																	
7.2.1 Talk to the infant in a steady, soft voice.	3*	30	7	70	2*	20	8	80	0*	0	10	100	5*	50	5	50	* The other 7, 8, 10 and 5 infants in group 1, 2, 3, and 4 respectively had no disengagement behaviors.
7.2.2 Hold both of the infant's arms close to the body.	3*	30	7	70	2*	20	8	80	0*	0	10	100	5*	50	5	50	* The other 7, 8, 10 and 5 infants in group 1, 2, 3, and 4 respectively had no disengagement behaviors.

Table 8 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
7.2.3 Console the infant for 10 minutes	3*	30	7	70	2*	20	8	80	0*	0	10	100	5*	50	5	50	* The other 7, 8, 10 and 5 infants in group 1, 2, 3, and 4 respectively had no disengagement behaviors.
7.2.4 Re-evaluate the infant's behavioral responses of readiness to receive tactile stimulation.	3*	30	7	70	2*	20	8	80	0*	0	10	100	5*	50	5	50	* The other 7, 8, 10 and 5 infants in group 1, 2, 3, and 4 respectively had no disengagement behaviors.
7.2.5 Start tactile stimulation when the infant has only engagement behavior. If the infant still has at least 1 disengagement behaviors, postpone tactile stimulation.	3*	30	7	70	2*	20	8	80	0*	0	10	100	5*	50	5	50	* The other 7, 8, 10 and 5 infants in group 1, 2, 3, and 4 respectively had no disengagement behaviors.

Table 9

Frequency and percentage of the nurses' practicability of using each statement of the guideline 4: Evaluating the behavioral and physiological responses of preterm infant during and after receiving tactile stimulation and management (n = 10/group)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
1. Evaluate the infant's behavioral responses during receiving tactile stimulation.																	
1.1 Evaluate engagement behaviors (satisfied responses).	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
1.2 Evaluate disengagement behaviors (unsatisfied responses).	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2. Evaluate the infant's behavioral responses after receiving tactile stimulation.																	
2.1 Evaluate engagement behaviors (satisfied responses).	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
2.2 Evaluate disengagement behaviors (unsatisfied responses).	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
3. Evaluate the infant's physiological response during receiving tactile stimulation.																	
3.1 Evaluate heart rate by using a pulse oximeter.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3.2 Evaluate respiratory rate and its characteristic.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
3.3 Evaluate saturation by using a pulse oximeter.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4. Evaluate the infant's physiological response after receiving tactile stimulation																	
4.1 Evaluate heart rate and its characteristic with a stethoscope for 1 minute.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4.2 Evaluate respiratory rate and its characteristic for 1 minute.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
4.3 Evaluate oxygen saturation by using a pulse oximeter.	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	

Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
5. Interpret results of the infant's physiological responses during and after receive tactile stimulation																	
5.1 Heart rate and its characteristic	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
5.2 Respiratory rate and its characteristic	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
5.3 Oxygen saturation	10	100	0	0	10	100	0	0	10	100	0	0	10	100	0	0	
6. Provide appropriate care for infant's behavioral and physiological responses based on the following four topics: topic 6.1-6.4																	
6.1 If the infant has engagement behaviors with normal physiological responses,																	
6.1.1 Continue tactile stimulation	8*	80	2	20	5*	50	5	50	10	100	0	0	6*	60	4	40	* The other 2, 5, and 4 infants in group 1, 2, and 4, respectively had some disengagement behaviors during receiving tactile stimulation

Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
6.1.2 Continuously assess the infant's behaviors and physiological responses until finishing tactile stimulation.	8*	80	2	20	5*	50	5	50	10	100	0	0	6*	60	4	40	* The other 2, 5, and 4 infants in group 1, 2, and 4, respectively had some disengagement behaviors during receiving tactile stimulation
6.1.3 Repeat tactile stimulation if the infant is satisfied. However, the total stimulation time should not be longer than 15 minutes.	8*	80	2	20	5*	50	5	50	10	100	0	0	6*	60	4	40	* The other 2, 5, and 4 infants in group 1, 2, and 4, respectively had some disengagement behaviors during receiving tactile stimulation
6.2 If the infant has disengagement behaviors with normal physiological responses.																	
6.2.1 If the infant is hungry, swaddle and talk to infant softly. Then feed the infant and postpone tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group was hungry
6.2.2 If the infant vomit or spit out: clean up, swaddle and talk to the infant softly, console, hold and lifted the infant's head. Then determine possible causes and postpone tactile stimulation.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group vomited or spitted out

. Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
6.2.3 If the infant has other disengagement behaviors																	
6.2.3.1 Provide slower tactile stimulation.	2*	20	8	80	5*	50	5	50	0*	0	10	100	4*	40	6	60	* The other 8, 5, and 6 infants in group 1, 2, and 4, respectively had no disengagement behaviors
6.2.3.2 Talk to an infant with soft voice for 10-15 seconds.	2*	20	8	80	5*	50	5	50	0*	0	10	100	4*	40	6	60	* The other 8, 5, and 6 infants in group 1, 2, and 4, respectively had no disengagement behaviors
6.2.3.3 Re-evaluate the infant's behavioral responses.	2*	20	8	80	5*	50	5	50	0*	0	10	100	4*	40	6	60	* The other 8, 5, and 6 infants in group 1, 2, and 4, respectively had no disengagement behaviors

Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
6.2.3.4 Start tactile stimulation when the infant is recovered from disengagement behaviors. If an infant still has any disengagement behaviors, provide exponential consoling activities for 2 minutes.	2*	20	8	80	5*	50	5	50	0*	0	10	100	4*	40	6	60	* The other 8, 5, and 6 infants in group 1, 2, and 4, respectively had no disengagement behaviors. The 2, 5, and 4 infants were recovered from disengagement behaviors after receiving care follow statement 6.2.3.1-6.2.3.4. And did not have any continued disengagement behaviors.
6.3 If the infant has engagement behaviors with abnormal physiological responses: pause tactile stimulation, evaluate physiological responses, provide appropriate care and consolation method.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group had engagement behavioral with abnormal physiological responses during and after receiving tactile stimulation.

Table 9 (Continued)

The CNPG statements	Group 1				Group 2				Group 3				Group 4				Remarks
	Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		Practicable		Impracticable		
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
6.4 If the infant has disengagement behaviors with abnormal physiological responses: stop tactile stimulation immediately, evaluate physiological responses, provide appropriate care and consolation method.	0*	0	10	100	0*	0	10	100	0*	0	10	100	0*	0	10	100	* No infant in any group had disengagement behavioral with abnormal physiological responses during and after receiving tactile stimulation.

Table 10

Frequency and percentage of the nurses' practicability of using each statement of the guideline 5, sub-guideline 5.1: Method of Gentle Human Touch (GHT) with preterm infants in incubators (Group 1) and cribs (Group 3) (n = 10/group)

The CNPG statements	Group 1				Group 3			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
1. Provide GHT in appropriate time as follows:								
1.1 When a preterm infant is in a drowsy, quite alert, or active alert state	10	100	0	0	10	100	0	0
1.2 10-15 minutes for each time	10	100	0	0	10	100	0	0
1.3 At least 3 times a day before or after feeding more than 30 minutes	10	100	0	0	10	100	0	0
2. Wash hand before providing GHT	10	100	0	0	10	100	0	0
3. Provide an appropriate environment (follow guideline 2, page 8)	10	100	0	0	10	100	0	0
4. Evaluate a preterm infant's readiness for GHT and management (follow guideline 3, page 18)	10	100	0	0	10	100	0	0
5. Warm hands by rubbing hands.	10	100	0	0	10	100	0	0
6. Take off an infant's hat	10	100	0	0	10	100	0	0
7. Loose an infant's wrapped-cloth	10	100	0	0	10	100	0	0
8. Remove an infant's clothes or discover some parts	10	100	0	0	10	100	0	0
9. Place an infant in a proper position (e.g. prone, supine, or side-lying)	10	100	0	0	10	100	0	0

Table 10 (Continued)

The CNPG statements	Group 1				Group 3			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
10. Stands or sits on a chair, nurse's elbows are at level of an infant's bed or lower edge of an incubator's window	10	100	0	0	10	100	0	0
11. Place both palms of hands gently and still on 2 positions of an infant's skin at the same time for 10-15 minutes								
11.1 If an infant is in a prone or side-lying position, place one palm of a hand on an infant's head and the other on an infant's buttocks and coccyx	10	100	0	0	10	100	0	0
11.2 If an infant is in a supine position, place one palm of a hand on an infant's head and the other on an infant's chest and abdomen. Also try to place an infant in a flex position (flexion of hands).	10	100	0	0	10	100	0	0
12. Gradually relax nurse's arms every 30 seconds	10	100	0	0	10	100	0	0
13. Continuously assess behavioral and physiological responses and management during GHT (follow guideline 4, page 23)	10	100	0	0	10	100	0	0
14. Evaluate and manage temperature during received GHT (follow guideline 2.3, page 11)	10	100	0	0	10	100	0	0
15. Swaddle an infant when finishing GHT	10	100	0	0	10	100	0	0
16. Evaluate behavioral and physiological responses after GHT (follow guideline 4, page 23)	10	100	0	0	10	100	0	0
17. Place an infant to relax for 10 minutes.	10	100	0	0	10	100	0	0

Table 11

Frequency and percentage of the nurses' practicability of using each statement of guideline 5, sub-guideline 5.2: Method of Multisensory Stimulation: Auditory, Tactile, Visual, and Vestibular (ATVV) with preterm infants in incubators (Group 2) and cribs (Group 4) (n = 10/group)

The CNPG statements	Group 2				Group 4			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
1. Provide ATVV in appropriate time as follows:								
1.1 When preterm infant is in quite alert or active alert state	10	100	0	0	10	100	0	0
1.2 15 minutes for each time	10	100	0	0	10	100	0	0
1.3 Twice a day before or after feeding more than 30 minutes	10	100	0	0	10	100	0	0
2. Wash hand before providing ATVV.	10	100	0	0	10	100	0	0
3. Provide an appropriate environment (follow guideline 2, page 8)	10	100	0	0	10	100	0	0
4. Evaluate preterm infant's readiness for ATVV and management (follow guideline 3, page 18)	10	100	0	0	10	100	0	0
5. Warm hands by rubbing hands.	10	100	0	0	10	100	0	0
6. Take off an infant's hat.	10	100	0	0	10	100	0	0
7. Remove an infant's clothes, except for a diaper.	10	100	0	0	10	100	0	0
8. Swaddle an infant with a towel, expose only the part to provide tactile stimulation.	10	100	0	0	10	100	0	0
9. Place an infant on a folded blanket which is put on a nurse's lap or in a crib.	10	100	0	0	10	100	0	0

Table 11 (Continued)

The CNPG statements	Group 2				Group 4			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
10. Provide auditory stimulation								
10.1 Talk to an infant with calm and soothing voice for 2 minutes before starting other stimulation and do it continuously during ATVV.	10	100	0	0	10	100	0	0
10.2 Talk softly, pauses often so an infant can respond back.	10	100	0	0	10	100	0	0
11 Provide visual stimulation								
11.1 Set a visual distance between an infant and nurse for 8-12 inches.	10	100	0	0	10	100	0	0
11.2 Try to maintain eye contact with an infant along ATVV.	10	100	0	0	10	100	0	0
11.3 Facilitate an infant to receive a visual stimulation by turning an infant's face to meet and a nurse's face.	10	100	0	0	10	100	0	0
11.4 Move an infant's face slowly side by side, and then a nurse moves her face following an infant to maintain eye contact for 2 minutes.	10	100	0	0	10	100	0	0
12. Provide tactile stimulation on an infant's head								
12.1 Place an infant in supine position.	10	100	0	0	10	100	0	0
12.2 Use palms and fingertips to caress an infant's head, from top of head to both sides of temporal by, 3 times.	10	100	0	0	10	100	0	0
12.3 Use a palm to caress an infant's forehead to neck to back of neck, 10 times.	10	100	0	0	10	100	0	0

Table 11 (Continued)

The CNPG statements	Group 2				Group 4			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
13. Provide tactile stimulation on an infant's back								
13.1 Place the infant in one side position, turn face to a nurse.	10	100	0	0	10	100	0	0
13.2 Use a palm to gentle long one-way stroke on an infant's back along spine from shoulders to coccyx, 3 times. Try and maintain eye contact by supporting the baby's head.	10	100	0	0	10	100	0	0
13.3 Use first 2 fingertips to stroke in a small circular motion on an infant's back from neck to coccyx along spine, 3 times.	10	100	0	0	10	100	0	0
14. Provide tactile stimulation on the infant's chest and abdomen								
14.1 Place the infant in supine position.	10	100	0	0	10	100	0	0
14.2 Use palms to long smooth strokes on an infant's chest and abdomen, start from clavicles pass chest to abdomen, 3 times.	10	100	0	0	10	100	0	0
14.3 Use palm to lightly stroke in large circular motion on an infant's abdomen, 3 times.	10	100	0	0	10	100	0	0
15. Provide tactile stimulation on the infant's arms and hands								
15.1 Place the infant in supine position.	10	100	0	0	10	100	0	0
15.2 Stretch one side of the infant's arm, and then use a palm to gently circular strokes from a shoulder to a wrist, 3 times.	10	100	0	0	10	100	0	0
15.3 Use a thumb to gently small circle stroke on an infant's palm, 3 times.	10	100	0	0	10	100	0	0

Table 11 (Continued)

The CNPG statements	Group 2				Group 4			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
15. Provide tactile stimulation on the infant's arms and hands (Continued)								
15.4 Tactile stimulate the other arm and hand with the same method.	10	100	0	0	10	100	0	0
16. Provide tactile stimulation on the infant's legs and feet								
16.1 Place the infant in supine position.	10	100	0	0	10	100	0	0
16.2 Stretch one side of the infant's leg, and then use a palm to gently circular strokes from hip to ankle, 3 times.	10	100	0	0	10	100	0	0
16.3 Use a thumb to gently small circle stroke on an infant's foot, 3 times.	10	100	0	0	10	100	0	0
16.4 Tactile stimulate the other leg and foot with the same method.	10	100	0	0	10	100	0	0
17 Provide tactile stimulation on the infant's face								
17.1 Place an infant in supine position.	10	100	0	0	10	100	0	0
17.2 Use 2 thumbs to lightly stroke across an infant's forehead to both tails of eyebrow, 3 times.	10	100	0	0	10	100	0	0
17.3 Use 2 thumbs to lightly stroke an infant's checks from upper nose to under ears, 3 times.	10	100	0	0	10	100	0	0
17.4 Use 2 thumbs to lightly circle stroke around an infant's eye muscles, 3 times.	10	100	0	0	10	100	0	0
17.5 Use thumb to lightly stroke an infant's neck under chin, 3 times.	10	100	0	0	10	100	0	0

Table 11 (Continued)

The CNPG statements	Group 2				Group 4			
	Practicable		Impracticable		Practicable		Impracticable	
	f	%	*f*	%	*f*	%	*f*	%
18. Provide vestibular stimulation								
18.1 Swaddle an infant with cloth.	10	100	0	0	10	100	0	0
18.2 Cuddle an infant in the arms.	10	100	0	0	10	100	0	0
18.3 Rock an infant for 5 minutes in either an up and down movement or in a side to side movement.	10	100	0	0	10	100	0	0
18.4 Maintain eye contact and talk softly to the infant while rocking. an infant can be facing towards or away from nurse.	10	100	0	0	10	100	0	0
19. Continuously assess behavioral and physiological responses and management during ATVV (follow guideline 4, page 23).	10	100	0	0	10	100	0	0
20. Evaluate and manage temperature during received ATVV (follow guideline 2.3, page 11).	10	100	0	0	10	100	0	0
21. Observe an infant's skin continuously whether the infant has red stain from ATTV.	10	100	0	0	10	100	0	0
22. Swaddle an infant when finishing ATVV.	10	100	0	0	10	100	0	0
23. Evaluate behavioral and physiological responses after GHT (follow guideline 4, page 23).	10	100	0	0	10	100	0	0
24. Place an infant to relax for 10 minutes.	10	100	0	0	10	100	0	0

APPENDIX F

List of Experts

1. Supaporn Dissaneewate, M.D.

   Neonatologist, Department of Pediatrics, Faculty of Medicine, Prince of Songkla University

2. Asst. Prof. Dr. Rachtawon Orapiriyakul

   Department of Pediatric Nursing, Faculty of Nursing, Prince of Songkla University

3. Miss Kanuengnid Wongpoj

   Head Nurse of Neonatal Moderate Care Unit, Songklanagarind hospital

VITAE

Name Miss Natthaya Cherngchalard

Student ID 5110420049

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing Science	Prince of Songkla University	2008

Scholarship Award During Enrollment

2008-2010 Teacher Scholarship for the Degree of Master of Nursing Science (International Program), Faculty of Nursing, Prince of Songkla University, Songkhla, Thailand.

List of Publication and Proceeding

Cherngchalard, N., Sen-ngam, K., & Punthmatharith, B. (2010, July 3). *Development of the Clinical Nursing Practice Guideline of Tactile Stimulation for Preterm Infants in NICU (Preliminary report)*. Paper presented at the 2010 National Research Conference on Humanities and Social Sciences Proceedings, Songkhla, Thailand.