THE DEVELOPMENT OF THE READINESS TO CHANGE CARDIAC HEALTH BEHAVIORS SCALE

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งานวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนามาตรวัดความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจของผู้ป่วยหลังผ่าตัดหัวใจในระยะ 3 เดือนแรกของการฟื้นสภาพหลังผ่าตัด โดยใช้กรอบแนวคิด Transtheoretical model มาตรวัดที่พัฒนาขึ้นประกอบด้วย 1) แบบสอบถามประเมินความพร้อม จำนวน 5 ฉบับ เพื่อประเมินความพร้อมในการเปลี่ยนพฤติกรรม 5 ด้านที่จำเป็นต่อการฟื้นสภาพ ได้แก่ การรับประทานยา การออกกำลังกาย การรับประทานอาหาร การป้องกันภาวะแทรกซ้อนและการจัดการอาการ 2) ไม้บรรทัดวัดความพร้อม จำนวน 5 ฉบับ เพื่อประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพทั้ง 5 ด้านที่กล่าวมา มาตรวัดทั้งหมดที่สร้างขึ้นมีความตรงตามเนื้อหา จากการประเมินโดยผู้ทรงคุณวุฒิ 5 คนอยู่ในเกณฑ์ดี หลังจากการปรับแก้เนื้อหาตามคำแนะนำจากผู้ทรงคุณวุฒิ มาตรวัดฉบับร่างทั้งหมดนำไปทดลองใช้ในกลุ่มตัวอย่างจำนวน 150 คน และใช้สถิติวิเคราะห์ข้อคำถามเพื่อเลือกข้อคำถามที่มีคุณภาพในการสร้างมาตรวัดจริง หลังจากนั้นนำมาตรวัดฉบับจริงไปทดสอบเพื่อหาความตรงและความเที่ยง โดยใช้กลุ่มตัวอย่าง 533 คน ผลการศึกษาพบว่า

แบบสอบถามประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจทั้ง 5 ฉบับมีค่าความสอดคล้องภายในอยู่ในช่วง .67-.86 ผลการวิเคราะห์องค์ประกอบเชิงยืนยันพบว่า แบบสอบถามทุกชุดประกอบด้วย 4 องค์ประกอบ เป็นไปตามสมมติฐานที่ตั้งไว้ ไม้บรรทัดวัดความพร้อมมีความเที่ยงแบบทดสอบซ้ำอยู่ในเกณฑ์ดี (kappa =.67-.70) แต่การประเมินระดับความพร้อมของผู้ป่วยมีความสอดคล้องกับแบบสอบถามในระดับต่ำ (20-23%) ผลการศึกษาครั้งนี้ยืนยันความตรงและความเที่ยงของแบบสอบถามที่สร้างขึ้น อย่างไรก็ตามไม้บรรทัดวัดความพร้อมยังมีข้อจำกัดด้านความตรงเชิงโครงสร้างซึ่งต้องการการศึกษาเพิ่มเติม

สาขาวิชา พยาบาลศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2555 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

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Readiness to change is a key factor for maintaining cardiac health behaviors including medication taking, exercise, nutrition taking, complication prevention, and symptom management throughout 3-month period after cardiac surgery. Valid and reliable instrument to measure patient's readiness is important; however, no instrument was developed for this purpose.

Aims of this study were to develop two types of scales to measure readiness to change (RTC) for cardiac health behaviors of patients following cardiac surgery. The first type was a set of 5 RTC questionnaires to measure RTC for medication taking, exercise, nutrition taking, complication prevention, and symptom management. The second type was a set of 5 readiness rulers to measure RTC of 5 behaviors mentioned above. The Transtheoretical Model was used as a theoretical basis. Content validity of both scales was assessed using a panel of experts. The original versions of both scales were pilot tested in 150 Thai cardiac surgical patients. After the revision based on pilot data findings, psychometric properties testing of the second draft scales were conducted in a sample of 533 Thai cardiac surgical patients from 4 geographic areas of Thailand.

Results of the study showed that the RTC questionnaires had Cronbach's alpha reliability ranged from .67-.86. Confirmatory factor analysis showed 4-factor structure best fit with the data. The test-retest reliability of the readiness rulers was acceptable (kappa .67-.70). However, percentage agreement of readiness stage allocation by RTC questionnaires and readiness rulers were low as 20-23%. The results revealed initial psychometric properties of the RTC questionnaires while conclusion on construct validity of readiness rulers need further study support.

Field of Study : Nursing Science Student's Signature .....
Academic Year : 2012 Advisor's Signature .....
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CHAPTER I
INTRODUCTION

Background and Significance of the Study

Strict practice of cardiac health behaviors is important for smooth recovery during the first three months after cardiac surgery. Cardiac surgical patients spend only 5-7 days postoperatively in the hospital (Sethares, Seiferts, & Smith, 2008). After that, they have to spend their remaining postoperative recovery at home while they still confront various problems such as cardiac arrhythmia, wound infection, heart failure, pain, dyspnea, fatigue, and difficult to sleep (Avato & Lai, 2002; Utriyaprasit & Moore, 2005). Importantly, these problems are reported as a major cause of high rate readmission within the first three months after surgery (Fredericks & DaSilva, 2010). The literature support that at least five behaviors must be adopted and continued in reducing postoperative complications as well as promotion of smooth recovery (Arthur, Daniels, Mckelvie, Hirsh, & Rush, 2000; Bergvik, Wynn, & Sorlie, 2008; Eliot, Lazaros, & Leeder, 2006; Fredericks & DaSilva, 2010). These behaviors consists of taking medication, continuing exercise, optimizing nutrition intake, monitoring signs and symptoms of complications, and symptom management (Barnason, Zimmerman, Schulz, & Tu, 2009; Fredericks, 2009; Kranich et al., 2008).

Although nurses emphasize these behaviors for the patients while hospitalized, most of them are unlikely to continue the recommendations after discharge. Clinical records in Thailand show that more than half of cardiac surgical patients fail to maintain these five critical behaviors after hospital discharge (Kaeduang, Leksawasdi, & Sucamvang, 2006; Rahulnan, 2002; Yamyim, 2005). In addition, twenty percent of

them were readmitted to the hospital due to preventable complications (Fredericks & DaSilva, 2010; Kaeduang et al., 2006; Kongbundansuk et al., 2010).

Current nursing practice to help patients achieve these five behaviors is through patient education (Fredericks, Ibrahim, & Puri, 2009; Goodman, 2009). Nurses provide education as individual teaching, education class, video, written information, or telephone intervention. However, these strategies have little to moderate effect on maintaining critical behaviors following cardiac surgery (Fredericks, 2006; Moore, 1997; Shepperd et al., 2013; Theobold & McMaurray, 2004). Some patients can change and maintain their behaviors, while others struggle to do so (Cassldy, 1999). Hence, a truly effective strategy is required to encourage adoption and maintenance of these behaviors.

"Readiness to change" is one of the major concepts postulated by the Transtheretical Model (TTM), which has been widely used to facilitate numerous behaviors change. Readiness to change (RTC) or stages of change (SOC) is a central construct of TTM. Individual possesses five SOC when changing behavior (Prochaska, DiClemente, & Norcross, 1992). Five stages are depicted by a temporal dimension of RTC according to an individual's intention and behavior. These stages are: precontemplation (no intention to make change), contemplation (start to be aware of the problem but have not made a commitment to make change), preparation (plan to make change within the next 30 days), action (had made change for < 6 months), and maintenance (had made change for ≥ 6 months and works to prevent relapse). Once individual is classified into the readiness stage, stage-matched intervention is provided to facilitate behavior change. Several studies support effectiveness of stage-

based interventions over traditional intervention approaches (Fernandez, Davidson, Griffiths, Juergens, & Salamonson, 2009; Noar, Chabot, & Zimmerman, 2007).

Roles of cardiovascular nurses are to provide comprehensive and continuity of care to cardiac surgical patients throughout their recovery. Adding patient's readiness and stage-matched intervention to usual care is one challenge idea. Prior to discharge, patient's readiness should be evaluated and stage-matched intervention should be provided to the patients. RTC on five critical behaviors, then, be assessed periodically at the out-patient clinic as well as at home environment. Once patient's readiness is determined, appropriated intervention will be tailored based on their readiness. Stage-matched nursing interventions then be designed and deliver to the patients to facilitate five target behaviors. In this way, goal of nursing interventions is to reach and maintain action stage on five critical behaviors throughout 3-month recovery period.

The first step to provide stage-matched intervention is to determine patient's readiness. However, application of the TTM to specific behaviors during a 3-month recovery period in patients with cardiac surgery has not been reported. There is no scale developed for measuring RTC regarding five critical behaviors among cardiac surgical population. Although some studies developed instruments to assess heart failure patient's readiness (Cazes, 2005; McKibbin et al., 2007; Sneed & Paul, 2003), none of them include five specific behaviors related to complications prevention and promotion of recovery post cardiac surgery. Thus, development of scales to measure RTC on five cardiac health behaviors of cardiac surgical patients is required.

Among various RTC measures, a continuous measure (multi-dimensional questionnaire) is preferable in research area while readiness ruler shows adventitious in clinical situation. The continuous measure is longer; however, their reliability and

validity are frequently stronger and preferable (Littell & Girvin, 2002). The University of Rhode Island Change Assessment Scale (URICA) is the most widely used continuous method; however, it was developed for general behavior and it might not best fit to the cardiac health behaviors during 3-month recovery period following cardiac surgery. Moreover, the content of the URICA may not be easily understood by Thai patients under different cultural background. The readiness ruler is 0-10 or 0-5 rating scale asking respondents to rate their level of readiness on a specific behavior. A readiness ruler offers a short and easy way to measure RTC in clinical situation. Concurrent validity and predictive validity were supported (Heather, Smailes, & Cassidy, 2008; LaBrie, Quinlan, Schiffman, & Earleywine, 2005).

In this study, five RTC questionnaires and five readiness rulers correlated to five critical health behaviors were developed and tested for their validity and reliability. Each questionnaire/readiness ruler will be used to classify patients into proper stage of readiness. It was hoped that the RTC questionnaires could serve as valid and reliable measures for research area, whereas readiness rulers would have beneficial for clinical practice when time of assessment is limited.

Objectives of the Study

1. To develop five RTC questionnaires and five readiness rulers corresponding to five health behaviors needed to facilitate recovery of Thai cardiac surgical patients
2. To test psychometric properties of five RTC questionnaires and five readiness rulers
3. To compare psychometric properties of five RTC questionnaires and five readiness rulers

Scope of the Study

This study aims to develop five RTC questionnaires and five readiness rulers to measure RTC on five behaviors among Thai cardiac surgical patients. The sample was adult Thai speaking patients who underwent cardiac surgery within 3 months. Data collection was conducted in outpatient departments and cardiac surgical units of seven tertiary hospitals from four geographic areas of Thailand (Central, North, Northeast, and South).

Operational Definitions

Readiness to change for cardiac health behaviors means intention of cardiac surgical patient to perform 5 cardiac health behaviors during the first 3-month recovery period. These 5 cardiac health behaviors are medication taking, exercise, nutrition taking, complications prevention, and symptom management. Readiness to change for cardiac health behaviors was assessed by the Readiness to Change Cardiac Health Behaviors Scale (RTC-CHBS) and the Readiness Rulers which were developed in this study. The RTC-CHBS is a set of 5 questionnaires which are:

1. The RTC- medication taking questionnaire (RTC-MQ)
2. The RTC- exercise questionnaire (RTC-EQ)
3. The RTC- nutrition taking questionnaire (RTC-NQ)
4. The RTC-complication prevention questionnaire (RTC-CQ)
5. The RTC-symptom management questionnaire (RTC-SQ)

The Readiness Rulers are: 1) The readiness ruler for medication taking (RR-medication); 2) The readiness ruler for exercise (RR-exercise); 3) The readiness ruler for nutrition taking (RR-nutrition); 4) The readiness ruler for complication prevention (RR-complication prevention); and 5) The readiness ruler for symptom management (RR-symptom management).

Readiness to change for medication taking behavior means the extent to which cardiac surgical patient intends to take all medications as prescribed by physician with correct time, dosage, and frequency (Cramer et al., 2008). The readiness to change for medication taking consists of 4 stages. The patient will be classified into 1 of 4 stages according to individual's level of intention and behavior using the RTC-medication taking questionnaire and the readiness ruler for medication taking. Four stages of readiness were defined as follows:

Stages of readiness	Operational definition
Precontemplation	– No intention to take medication consistently after surgery – Unaware or under-aware that not taking medication consistently as prescribed can affect their recovery – No knowledge regarding postoperative medications that must be consistently taken in order to control postoperative complications such as cardiac arrhythmia, infection, or heart failure
Contemplation	– Thinks about how to take medication consistently but not taking them consistently right now – Knows that after heart surgery they should take medications as prescribed consistently but they unable to overcome obstacles – Has low confidence to get the better ways to be able to take medications consistently
Preparation	– Plans to start taking medication consistently within 30 days – Seeks knowledge and strategies to be able to take medications consistently as prescribed – Has demonstrated some actions to help themselves to be able to take medication consistently – Trying to take medications consistently but occasionally forgets to take some medications or late taking
Action	– Takes medication consistently as prescribed without missing any dose or making any change for < 3 months – Acknowledges effort to continue taking medications throughout recovery period

Readiness to change for exercise behavior means the extent to which cardiac surgical patient intends to follow exercise protocol after surgery especially walking exercise that should be increased by 5 min/week until reach 30 minutes continuous walking, and pulse rate should be monitored before and after exercise (Chaivanichsiri, 2011). The readiness to change for exercise behavior consists of 4 stages. The patient will be classified into 1 of 4 stages according to individual's level of intention and behavior using the RTC-exercise questionnaire and readiness ruler for exercise. Four stages of readiness were defined as follows:

Stages of readiness	Operational definition
Precontemplation	– No intention to follow exercise protocol after surgery – Unaware or under-aware that not following exercise protocol can affect their recovery – No knowledge regarding postoperative exercise that help to regain heart function and promote recovery
Contemplation	– Thinks of following exercise protocol but do not follow the protocol right now – Knows that they should follow exercise protocol after surgery but unable to overcome obstacles – Has low confidence to get the better ways to be able to follow exercise protocol
Preparation	– Plans to follow exercise protocol within 30 days – Seeks knowledge and strategies to be able to follow exercise protocol – Has demonstrated some actions to help themselves to be able to follow exercise protocol – Trying to follow exercise protocol but has never complete all recommendations
Action	– Has followed exercise protocol for less than 3 months – Acknowledges effort to follow exercise protocol throughout recovery period

Readiness to change for nutrition taking behavior means the extent to which the cardiac surgical patient intends to follow nutrition plan including eating high-protein, high-fiber, low-fat, low-salt, and low-sugar diets (Cleveland Clinic, 2010; STS, 2009). The readiness to change for nutrition taking behavior consists of 4 stages. The patient will be classified into 1 of 4 stages according to individual's level of intention and behavior using the RTC-nutrition taking questionnaire and the readiness ruler for nutrition taking. Four stages of readiness were defined as follows:

Stages of readiness	Operational definition
Precontemplation	– No intention to follow nutrition plan after surgery – Unaware or under-aware that not following nutrition plan after surgery can affect their recovery – No knowledge regarding postoperative nutrition taking that help to promote recovery
Contemplation	– Thinks of following nutrition plan but do not follow the plan right now – Knows that after surgery they should follow nutrition plan but they unable to overcome obstacles – Has low confidence to get the better ways to be able to follow nutrition plan
Preparation	– Plans to follow nutrition plan after surgery within 30 days – Seeks knowledge and strategies to be able to follow nutrition plan – Has demonstrated some actions to help themselves to be able to follow nutrition plan – Trying to follow nutrition plan but sometime deviate from the plan
Action	– Has adhered to nutritional plan every day for less than 3 months. – Acknowledges effort to follow nutrition plan throughout recovery period

Readiness to change for complication prevention behavior means the extent to which cardiac surgical patient intends to prevent his/her postoperative complications including wound infection, arrhythmias, and heart failure after surgery (Fredericks et al., 2009). The readiness to change for complication prevention consists of 4 stages. The patient will be classified into 1 of 4 stages according to individual's level of intention and behavior using the RTC-complication prevention questionnaire and the readiness ruler for complication prevention. Four stages of readiness were defined as follows:

Stages of readiness	Operational definition
Precontemplation	– No intention to prevent postoperative complications – Unaware or under-aware that not taking action on prevention complications by themselves can affect recovery – No knowledge related to postoperative complications that usually occur during recovery period and (s)he has to pay attention in prevention of these complications
Contemplation	– Thinks of prevention postoperative complications by themselves but do not take any action – Knows that after heart surgery they should take action on prevention postoperative complications but they unable to overcome obstacles – Has low confidence to responsible for prevention postoperative complications
Preparation	– Plans to take action on prevention postoperative complications within 30 days – Seeks knowledge and strategies to prevent postoperative complications – Has demonstrated some actions on prevention postoperative complications – Trying to follow recommendations for prevention postoperative complications but inconsistently perform
Action	– Consistently follows recommendations for prevention postoperative complications for less than 3 months – Acknowledges effort to follow recommendation for prevention postoperative complications throughout recovery period

Readiness to change for symptom management behavior means the extent to which cardiac surgical patient intends to use both medication and non-medication strategies to manage postoperative symptoms such as pain, constipation, and difficult to sleep (Dodd et al., 2001). The readiness to change for symptom management behavior consists of 4 stages. The patient will be classified into 1 of 4 stages according to individual's level of intention and behavior using the RTC-symptom management questionnaire and the readiness ruler for symptom management. Four stages of readiness were defined as follows:

Stages of readiness	Operational definition
Precontemplation	– No intention to manage postoperative symptoms after surgery – Unaware or under-aware that poor symptom management can affect their recovery – No knowledge that pain, constipation, and difficult to sleep are the major symptoms occurring during recovery from heart surgery and symptoms self-management can enhance smooth recovery
Contemplation	– Thinks of symptom self-management but do not start to do right now – Knows that they should take action on symptom management after surgery but they unable to overcome obstacles – Has low confidence to manage postoperative symptoms by him/herself
Preparation	– Plans to start symptom self-management within 30 days – Seeks knowledge to use both medicine and non-medicine strategies to manage postoperative symptoms – Has demonstrated some actions on symptom self-management – Trying to use both medicine and non-medicine strategies to manage postoperative symptoms but sometimes rely on medication only
Action	– Follow recommendations to use both medicine and non-medicine strategies to manage postoperative symptoms for less than 3 months – Acknowledges effort to use both medicine and non-medicine strategies to manage postoperative symptoms throughout recovery period

Expected Benefits of the Study

The RTC questionnaires and readiness rulers will be beneficial to cardiovascular nurses by using them in clinical setting and research area. In clinical setting, these instruments will be used to classify cardiac surgical patient into a proper stage of readiness which is an important data to select stage-matched interventions for each patient. Without these instruments, nurses evaluate patient's readiness based on their own experience or without knowledge based purpose. These scales can be used in cardiac surgical unit where discharge planning takes place as well as in outpatient department where cardiac surgical patients come for follow-up visit. Furthermore, these scales can serve as valid and reliable tools for home health care nurses when they undertake home visit. In research area, these scales will be used as valid and reliable instruments to measure readiness to change for cardiac health behaviors for further knowledge development.

CHAPTER II

LITERATURE REVIEW

This chapter provides current knowledge in relation to the development of readiness to change cardiac health behaviors scale for Thai cardiac surgical patients. Contents start from the concept of readiness to change, then move to the Transtheoretical model and cardiac health behaviors. Conceptualization of readiness to change cardiac health behaviors among cardiac surgical patients is provided before moving to the existing instruments measuring readiness to change for cardiac health behaviors. Scientific knowledge of scale development process and psychometric properties are described in the last part.

1. Readiness to Change

"Readiness to change" is the concept that has been used in nursing profession for a long period of time. As nursing profession plays a key role in helping patients to engage and maintain benefit health behaviors, nurses must consider patient's readiness prior to provide appropriate interventions (Dalton & Gottlieb, 2003; Fowler, 1998). Literature review on readiness to change (RTC) concept shows that this concept can be conceptualized in two ways; as a state, or as a process. As a state concept, RTC is assessed and interpreted as readiness or not readiness to make change on their behaviors. As a process concept, it represents a process of becoming more ready overtime to make change (Dalton & Gottlieb, 2003; Prochaska & Norcross, 2001; Rebmann, 2006). Readiness to change indicates a willingness or openness to engage in a particular process or to adopt a particular behavior (DiClemente, Schlundt, & Gemmel, 2004). When RTC is studied as a process, it is usually a part of

a larger process which is composed of multiple stages. Various studies of RTC as a process focus on different level of readiness or different stages of readiness (Martin, Velicer, & Fava, 1996; Spahn et al., 2010; Spencer, Adams, Malone, Roy, & Yost, 2006).

Concept analysis indicates the congruence of RTC as a process concept in nursing practice. The concept analysis by Fowler (1998) indicated that RTC consists of five components including 1) a person has reevaluated present behavior and concern benefit of changing behavior; 2) barriers to changes were perceived, and a willingness to remove these barriers presented; 3) a commitment to initiate and maintain the behavior change was made; 4) a state of control over personal behaviors was presented; and 5) a sense of action was seen. Readiness to change was described as "a conscious awareness on the part of patients that they, of their own will, have considered and determined that a particular behavior change will be useful. Furthermore, the patient has identified barriers that may prevent behavior change and has accepted responsibility for initiation of the behavior. Lastly, a sense of control and impending action by the patient must be presented"(Fowler, 1998).

A concept analysis by Dalton & Gottlieb (2003) described that RTC is both a state and a process. A concept of readiness was derived from five patients with multiple sclerosis. Readiness to change concept is the process of becoming ready over time. This process consists of three phases. The first phase is "realizing something needs to change", which means the extent to which persons are aware of their need to initiate change. The second phase called "weighting the cost/benefit" refers to the different ways of balancing determined by the person on the advantages and disadvantages of changing. The third phase, "planning for action", describes the

situation in which the benefits outweigh costs and persons begin to make a specific plan of change and/or make some changes. Along with the readiness process, person could be in a readiness state which is characterized by the variation in persons' desire and/or intent to take action. Persons can be in a state of high readiness (desire to change and intent to take action), moderate readiness (either a desire to change or the intent to take action), or low readiness situation (lack of desire to change and intent to take action). A state of readiness in this meaning is not a static state or an outcome. State of readiness refers to a state and not trait so it can change overtime (Dalton & Gottlieb, 2003).

Looking the RTC concept as a process is in congruence with nursing practice in reality. Since health behavior means any activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting or maintaining health (Nutbeam, 1998). nursing intervention is associated with helping patients to maintain behaviors in order to promote, protect, or maintain health that often require long time period. Therefore, RTC on health behavior has never been a static state. On the other hand, RTC should be the information regarding the readiness level that a person is in along the process of behavioral change. Person can be in a higher level or lower level of readiness according to his or her own health conditions or environmental situations. In this case, RTC should be evaluated prior to desire appropriate nursing interventions at a time (Croghan, 2005; Fowler, 1998).

There are some psycho-educational theories described the RTC as a series of stages in a process of behavior change. Among these theories, the Transtheoretical Model is a well-known comprehensive model and has been widely used. Detail of this model is discussed below.

2. The Transtheoretical Model

The Transtheoretical Model (TTM) is a model of intentional behavior change that provide the lens for looking at changing behavior and a person's readiness to create new behaviors, modify existing behaviors, or stop problematic behaviors (DiClemente, 2005, 2007; Prochaska, Wright, & Velicer, 2008). The purpose of this model is to help understand the phenomenon of the human behavior change. The TTM has critical assumptions as follows:

1) No single theory can account for all complexities of behavioral change. A more comprehensive model is most likely to emerge from integration across major theories.

2) Behavior change is a process that unfolds over time through a sequence of stages.

3) Stages are both stable and open to change, just as chronic behavioral risk factors are effectively by traditional action-oriented behavior change program.

4) The majority of at-risk population is not prepared for action and will not be served effectively by traditional action-oriented behavior change programs.

5) Specific processes and principles of change should be emphasized at specific stages to maximized efficacy.

The TTM framework consists of four constructs: the stages of change, processes of change, decisional balance, and self-efficacy.

2.1 Stages of change

Stages of change (SOC) is a core construct of the TTM which is conceptualized as a combination of intention and actual behaviors. The five stages of

change represent an increasing intent to change one's behavior, from no intention to change (precontemplation stage), to beginning to consider change (contemplation stage), to readiness to change in the near future (preparation), to early enacting of the behavior change (action stage), and to maintaining the change (maintenance stage)(Jezewski et al., 2009; Prochaska, 2008).

The SOC is usually referred to as stages of readiness. People are classified by their readiness to change (RTC) into one of five stages (DiClemente, 2007; Prochaska, Wright, et al., 2008); hence, sometimes SOC is used interchangeable with RTC. These five stages are illustrated by a temporal dimension of RTC based on an individual's intention and behavior (Prochaska et al., 1992).

2.1.1 Precontemplation. Precontemplation stage (PC) describes individuals who do not intend to change their behavior in the near term, usually measured at the next 6 months. Most people in this stage are unaware or under-aware of their problematic behaviors. People may be in this stage because they are uninformed or under-informed about the consequences of their behaviors. They may have tried to change their behavior for several times or may want to change at some future time, and become demoralized about their ability to change. Others may not want to change at all. They tend to avoid reading, talking, listening, or thinking about their behavior. They are often characterized as resistant or unmotivated patients or as not ready for behavior change program. Traditional action-oriented interventions do not match their readiness level (Prochaska, 2005; Prochaska & Norcross, 2001; Prochaska, Redding, & Evers, 2008).

2.1.2 Contemplation. Contemplation stage (C) describes individuals who are intending to take action on changing their behaviors in the next 6

months. They are more aware than precontemplators on the pros of changing but are also aware of the cons. They are seriously thinking that problem exists and are seriously thinking about overcoming it but still do not have commitment to take any action. The balance between pros and cons can produce profound ambivalence and keeps these people stuck in contemplation for a period of time. These people also are not ready for traditional action-oriented behavior change program that expect participants to take action immediately (Prochaska, 2005; Prochaska & Norcross, 2001; Prochaska, Redding, et al., 2008).

2.1.3 Preparation. Preparation stage (PR) describes individuals who are intending to take action within the next 30 days. Typically, people in this stage already have taken some significant steps toward the behavior and report some small behavior changes. They have a plan of action, such as joining a health education class, consulting a counselor, talking to their physician, attending a self-help group, or adopting a self-change approach. These people should be recruited for action-oriented programs (Prochaska & Norcross, 2001; Prochaska, Redding, et al., 2008; Redding, Rossi, Rossi, Velicer, & Prochaska, 2000). This stage combines intention and behavioral criteria (Prochaska & Norcross, 2001). Although they have made some actions to change their behavior, people in preparation stage have not yet reached a criterion for effective action (Norcross, Krebs, & Prochaska, 2011).

2.1.4 Action. Action stage (A) describes individuals who modify their behaviors, experiences, and/or environment to overcome their problems. Action is observable, behavior change often has been equated with action, however, individuals must reach a criterion that professionals agree is sufficient to reduce health risks. Individuals are classified in action stage if they have successfully take

action on target behavior for a period from 1 day to 6 months (Prochaska, 2005; Prochaska & Norcross, 2001; Prochaska, Wright, et al., 2008; Redding et al., 2000).

2.1.5 Maintenance. Maintenance stage (M) describes individuals who have work to prevent relapse and consolidate the gains attained during action. Being able to remain free of problem behavior and to consistently engage in a new behavior for more than 6 months are the criteria for considering individual to be in this stage (Prochaska, 2005; Prochaska & Norcross, 2001; Redding et al., 2000).

Since each stage represents a constellation of tasks that create the foundation to move forward to the higher stage (DiClemente, 2007), SOC is a complex construct as it includes different variables such as intention, actual behaviors, and duration attributes (Lippkes, Zeigelmann, Schwarzer, & Velicer, 2009). The three first stages are more characterized by individual's intention, whilst the latter two stages are more action attribution by nature. Duration of time frames is the most criticism part of the TTM. Time frames described for each stage may be more or less appropriate for different behaviors (Lippke, Ziegelmann, Schwarzer, & Velicer, 2009). For some behaviors such as nutrition and exercise, empirical evidence in favor of the chosen time frames is lacking (Sutton, 2005). In regards to time frames issue, three implications were suggested: (a) assessment only qualitative characteristics should be examined (Nigg et al., 2005); (b) time frames might be studied in more depth; (c) substitutes for time frames (Lippke et al., 2009).

The SOC have predictable relationships with other construct in the TTM such as processes of change, decisional balance, and self-efficacy (Prochaska et al., 1992; Prochaska, Wright, et al., 2008).

2.2 Processes of change

Processes of change explain a series of tasks that individual need to accomplish in order to create, modify, or stop target behaviors (DiClemente, 2005). Individual in different stages use different processes of change to move through the stages. These processes of change importantly guide stage-matched interventions, since these processes like the independent variables individual need to apply to move from stage to stage (Prochaska & Velicer, 1997a). There are ten distinct processes of change which can be divided into five cognitive/experiential and five behavioral processes.

Experiential processes include consciousness-raising, dramatic relief, environmental reevaluation, social liberation, and self-reevaluation. Behavioral processes include counter-conditioning, helping relationships, reinforcement management, stimulus control, and self-liberation. The TTM suggests that behavior change is facilitated if interventions focus on change processes that are match to the stage of change of individual. Explanations of processes change are as follows (Prochaska & Velicer, 1997a):

2.2.1 Consciousness raising Consciousness raising involves increased awareness about the causes, consequences, and cures for a particular behavior. Interventions that enhance consciousness raising include feedback, education, confrontation, interpretation, bibliotherapy, and media campaigns.

2.2.2 Dramatic relief Dramatic relief initially produced increased emotional experiences, followed by reduced affect or anticipated relief if appropriate action is taken. Interventions that can that can initiate dramatic relief include role-playing, grieving, personal testimonies, health risk feedback, and media campaigns.

2.2.3 Self-reevaluation Self-reevaluation combines both cognitive and affective assessments of individual's self-image with and without problematic behavior. Techniques that can make people evaluate themself are value clarification, healthy role models, and imagery.

2.2.4 Environmental reevaluation Environmental reevaluation combines both cognitive and affective assessments of how the presence or absence of a problematic behavior affect individual's social environment, such as impact of smoking on others or family members. It includes individual's awareness that he/she can be a positive or negative role model for others. Empathy training, documentaries, testimonials, and family interventions can lead to increase environmental reevaluation.

2.2.5 Self-liberation Self-liberation is both the belief that individual can change and the commitment and re-commitment to act on that belief. New Year's resolutions, public testimonies, and multiple rather than single choices enhance what the public calls willpowers.

2.2.6 Social liberation Social liberation requires an increase in social opportunities or alternatives, especially for people who are relatively deprived or oppresses. Advocacy, empowerment procedures, and appropriate policies can produce increased opportunities for minority health promotion, gay health promotion, and health promotion for impoverished people. Examples of the strategies for social liberation include smoke-free zone, salad bar in school lunch room, and easy access to condom and contraceptives.

2.2.7 Counterconditioning Counterconditioning requires learning healthier behaviors that can substitute problematic behaviors. Relaxation, assertion,

desensitization, positive-self statement, and nicotine replacement are examples of counterconditioning strategies.

2.2.8 **Stimulus control** Stimulation control removes cues for unhealthy habits and adds prompts for healthier behaviors. Examples of stimulus control techniques are avoidance, environmental re-engineering, and self-help group. The purposes of these strategies are to support change and reduce risk for relapse.

2.2.9 Contingency management Contingency management gives consequences for taking steps in particular direction. Contingency management includes punishment and reward; however self-change is more likely to rely on reward rather than punishment. Reinforcement is also emphasized because the philosophy of the TTM is to work in harmony with how people change naturally. Examples of techniques to increase reinforcement include contingency contracts, overt and covert reinforcements, incentives and group recognition. These techniques also increase the probability of repeated healthier responses.

2.2.10 Helping relationships Helping relationships is the combination of caring, trust, openness, and acceptance, as well as support for healthier behavior change. The sources of support can be come from rapport building, therapeutic alliances, counselor calls, and buddy systems.

In earlier stages, individual uses cognitive, affective, and evaluative processes to progress through stages. In later stages, individual relies more on commitments, conditioning, contingencies, environmental controls, and support for progressing toward maintenance (Table 1). For instance, helping individual progresses from precontemplation to contemplation, consciousness raising and dramatic relief should be applied. Using contingency management, counterconditioning, and stimulus

control interventions to promote changing from in precontemplators are considered as theoretical, empirical, and practical mistake (Prochaska, Redding, et al., 2008).

Table 1 Processes of Change that Mediate Progression of the Stages of Readiness

	Precontemplation	Contemplation	Preparation	Action	Maintenance
Processes	Consciousness raising Dramatic relief Environmental Reevaluation Social liberation				
		Self-reevaluation			
				Self-liberation	
					Counterconditioning Helping relationships Reinforcement management Stimulus control

Previous studies demonstrated effectiveness of stage-matched intervention based on processes of change. For instance, stage-specific interventions on dietary behavior among family member of hospitalized cardiovascular disease patients are shown below (Mochari-Greenberger, Terry, & Mosca, 2010).

RTC stage	Intervention strategy
Precontemplation	- Increase person awareness about cardiovascular disease and the link between fat in the diet and cardiovascular risk. - Provide personally information regarding diet recommendation for cardiovascular disease risk reduction. - Ask individuals to express opinion about his or her risk of cardiovascular disease cardiovascular disease and need to make diet changes. - Set individual specific diet goal.
Contemplation	- Increase individual's confidence that he/she can reduce saturated fat in his/her diet and make other diet changes. - Review expected benefits of saturated fat reduction on cardiovascular disease cardiovascular disease risk factors.

	- Provide personalized information about diet recommendations for cardiovascular disease risk reduction. - Discuss barriers to saturated fat reduction that individual may be facing and problem solve to resolve them. - Encourage individual to seek family/social support. - Set one or more diet goals.
Preparation	- Encourage individual to set specific diet change goals. - Provide personalized information about diet recommendations for cardiovascular risk reduction. - Create a plan for diet change. - Encourage individual to seek family/social support. - Review with person what he/she is already doing that is consistent with heart-healthy diet goals.
Action	- Provide personalized information about diet recommendations for cardiovascular risk reduction. - Review behaviors that have helped individual adhere to reduced saturated fat plan. - Discuss strategies to cope with barriers to diet adherence. - Encourage individual to seek family/social support. - Set specific diet behavior goals.
Maintenance	- Provide personalized information about diet recommendations for cardiovascular disease cardiovascular risk reduction. - Review family/social support strategy and options to increase social support. - Discuss action plans for diet challenges that may arise - Set more rigorous diet goals, if individual is motivated to make more changes. - Discuss programs available/convenient for participant to keep him or her on track. - Support individual in improving adherence to diet goals if a period of reduced adherence or nonadherence occurs.

2.3 Decisional balance

The decisional balance construct is originally based on the Janis & Mann's (1977) model of decision making that consisted of four categories of pros and four

categories of cons. Decision balance in TTM relies on only two-factor structure of pros and cons based on empirical supports. Decision balance reflects an individual's relative weighing of the pros and cons, or benefits and costs, of changing behavior. Differences in decisional balance tend to related to different stages of readiness (Prochaska & Velicer, 1997b). People in precontemplation stage perceive more barriers (cons) than benefits (pros) to change, while those in the action stage perceive more benefits than barriers. The cons decrease from contemplation to action, and the pros and cons is cross over prior to action. The assumption of TTM is that individual will begin an action to change behavior when the pros exceed the cons of behavior change (Prochaska & Velicer, 1997b). In the progression from precontemplation to action stage, the pros of change generally increase by about one standard deviation, and the cons of change tend to decrease by about one-half of a standard deviation (Hall & Rossi, 2008; Prochaska et al., 1994).

2.4 Self-efficacy

The self-efficacy construct was integrated into TTM from Bandura's (1982) self-efficacy theory. In TTM, self-efficacy is described as the situation-specific confidence that individual engage in the healthy behavior without relapsing to his/her unhealthy or high-risk behavior (Prochaska & Velicer, 1997b). Self-efficacy tends to decrease between the precontemplation stage and contemplation stage. Self-efficacy is considered important for people to move through the upper SOC. An example of this would be when an individual moves from the contemplation to preparation stage, and preparation to action stage (Kraft, Sutton, & Reynolds, 1999; Prochaska, Wright, et al., 2008).

In the present study, the SOC construct from TTM was applied to operationalize construct of the RTC. There are three reasons for the selection of the SOC construct. Firstly, the SOC construct gives a direct and well defined meaning of RTC on target health behaviors. The SOC construct provides clear qualitative characteristics of a person in each stage of readiness, and also provide the concrete way to measure individual's RTC. RTC is a process that can be divided into several stages which is compatible with the literature review. Secondly, using the SOC construct as a framework serves the purpose of this study, which is to develop the instruments to classify patients regarding their readiness, and this data will enable nurses to design an effective stage-matched intervention. The scale developed based on this perspective will be the parsimonious and practical sound measure for clinical practice. Lastly, tailoring interventions regarding individual's readiness have produced improved outcomes among previous cardiovascular nursing literature (Fernandez et al., 2009; Jue & Crunningham, 1998; Krummel et al., 2001; Nes & Sawatzky, 2010). Instead of providing the same strategy to all patients, nurses can consider stage-matched intervention to make more chance of success in behaviors change. Integrating the idea that patients in different stages of readiness will get benefit from different interventions into the traditional practice will save time and enhance specific outcomes.

3. Cardiac Health Behaviors for Cardiac Surgical Patients during Recovery Period

Cardiac surgery, including coronary artery bypass grafting, valve replacement or repair, and closure septum defect, is considered as a major surgery that usually needs 6-12 weeks for fully recover (STS, 2009). During this recovery period, patients confront various physiological and psychological changes such as loss of appetites, swelling in their legs, difficulty sleeping at night, depress or anxiety (Lopez, Ying, Poon, & Wai, 2007; Utriyaprasit & Moore, 2005). Patients may suffer from postoperative symptoms such as incisional pain, muscle pain, fatigue, dyspnea, and constipation (Barnason et al., 2008; Utriyaprasit & Moore, 2005). Not only normal changes, but patients are also at risk for postoperative complications such as cardiac arrhythmias, wound infection, and heart failure (Avato & Lai, 2002). Importantly, these complications are reported as a major cause of high rate readmission during the first 3 months after surgery (Fredericks & DaSilva, 2010; Kaeduang et al., 2006; Kongbundansuk et al., 2010).

Having fully recovery with less incidence of preventable complications depend on how well the patients engage in the required health behaviors during their recovery period. Now a day, patients who have had cardiac surgery spend only 5-7 days of their recovery in the hospital (Hengcharoensuwan, Utriyaprasit, Sindhu, & Laksanabunsong, 2010; Sethares et al., 2008). After that, they have to spend their remaining recovery period at home. This situation forces the patients and their families to be more independent in taking care of themselves. The more the patients strict in practicing all necessary health behaviors, the less complications occur and the less chance for readmission (Fredericks & DaSilva, 2010).

In general, health behavior means any activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting or maintaining health (Nutbeam, 1998). Cardiac health behaviors in the present study focused on any activity done by cardiac surgical patients, for the purpose of maintaining health during recovery period and preventing complications after cardiac surgery. The literature review showed that at least five major health behaviors are needed to facilitate fully recovery during the first three months after cardiac surgery (Arthur et al., 2000; Bergvik et al., 2008; Eliot et al., 2006; Fredericks, Lo, Ibrahim, & Leung, 2011). These health behaviors consisted of medication taking, exercise, nutrition taking, complication prevention, and symptom management. Detail of each behavior was presented in order to give clear definitions for specific behaviors in this study.

3.1 Medication taking

After surgery, cardiac surgical patients continue to take a number of medications for a while. These medications composed of antiplatelet drug such as Clodiplogel and Aspirin to prevent the formation of blood clots that can block the graft, nitrates to prevent further episodes of chest pain especially in case of some arteries cannot bypass. Beta blockers, angiotensin converting enzyme (ACE) inhibitors will be given for lowering blood pressure. Amiodarone and Wafarin will be continued in case with the onset of atrial fibrillation (Cook-Cambell & Sefton, 2010). In addition, lipid lowering therapy and statins are most common used for secondary prevention (Eagle et al., 2004). Some medications have been taken preoperatively. Adding to what the patients were taking preoperatively, patients usually receive a significant amount of new medications during postoperative period. Cardiac surgical

patients have to take these medications for at least 3-4 weeks to several years depend on type of surgery and patient's condition (Eagle et al., 2004). While the patients felt that they had enough knowledge about their medication taking (Beggs et al., 1998), only 20% adherence to medication regimen was reported among cardiac surgical patients at one week post hospital discharge (Fredericks et al., 2011).

All medications must be taken continuously without missing any doses or not make any changes (Artinan, Magnan, Sloan, & Lange, 2002; Cebeci & Celik, 2008; Fredericks, 2009; Titler & Petti, 1995), and have to contact their doctor before stopping, starting, or altering medications (Artinan et al., 2002; Fredericks & DaSilva, 2010; Fredericks et al., 2009). Based on the definition of medication adherence by Cramer et al. (2008) and literature support as mentioned, medication taking of cardiac surgical patients means the patients take all medications as prescribed by the physician with correct time, dosage, and frequency.

3.2 Exercise behavior

Proper exercise facilitates postoperative healing and recovery. While in the hospital, the cardiac rehabilitation staff will find a program that is suitable for each patient. The cardiac rehabilitation team will evaluate patients' ability and progression in exercise. This helps patients to know how their body response to exercise. It also helps them to suggest a home program that is best for each patient. Patients post cardiac surgery should perform exercise activities followed exercise regimen provided in cardiac rehabilitation program. Patients and health profession usually set patient's goal for exercise while in hospital setting. Patients were instructed to walk two to four times per day (in addition to walking to the bathroom or kitchen). They should plan to increase walking time by 1-2 minutes every other day if tolerated (Fredericks

et al., 2009; Fredericks et al., 2011; Kranich et al., 2008). The goal is to reach 30-45 minutes of continuous walking, 3 to 4 times per week. Avoiding strain such as putting weight on upper arms, shoulders, back, neck, and chest were suggested during the first six weeks post-surgery.

During the first six weeks, cardiac surgical patients should not lift, push, or pull objects heavier than 4.5 kgs (Fredericks et al., 2011; STS, 2009). Moreover, pulmonary exercise by using incentive spirometer (Fredericks et al., 2011), deep breathing and coughing exercise should be performed at least three times every hour a day to prevent pulmonary complications (Artinan et al., 2002; Cebeci & Celik, 2008; Fredericks et al., 2011; Titler & Petti, 1995). The patients must stop any exercise if they experience shortness of breath, dizziness, leg cramping, unusual fatigue, and/or chest pain. If post-exercise pulse rate is faster than 30 beats of resting pulse rate, it means that he/she exercises too hard, and should gradually discontinue the exercise.

The literature review showed that during recovery period, patients did not followed walking regimen as recommended by healthcare providers but consider household work as exercise instead (Kendel, Dunkel, Lehmkuhl, Hetzer, & Regitz-Zagrosek, 2008; Moore, 1996). At two month post hospital discharge, patient still had the difficulty in performing physical activity and activity daily living. Thirty percent of patients reported that incision pain was the main problem (LaPier et al., 2008). Promotion of exercise was one of the area of patient education across institutions. Patients felt that they know how much walking to do and how to increase their walking (Beggs et al., 1998). Twenty five of the patients did not exercise at all, while only 48% of the patients maintain their walking exercise throughout 3-month recovery period (Moore, Dolansky, Ruland, Pashkow, & Blackburn, 2003). Exercise

such as using incentive spirometer, breathing exercise and increase walking time was reduced statistically significant at 1 week after hospital discharge (Fredericks et al., 2011).

During early recovery period, cardiac surgical patients should attend cardiac rehabilitation phase II and III to improve physical recovery and prevent pulmonary complications. However, less amount of Thai patients attend cardiac rehabilitation program compared to Western world. Transportation cost, inconvenience, and lack of supports are three major reasons for poor attending rate for rehabilitation program. Even home cardiac rehabilitation programs were developed to overcome this problem; however, it only served to certain patients. For this reason, routine practice is emphasized on encouraging patients to continue exercise during their recovery period at home (Chaivanichsiri, 2011; Charoenkul, Khuangsirikul, Jalayondeja, & Krittayaphong, 2007). Home-based walking program is considered as an alternative choice of exercise training in Thai cardiac surgical patients other than hospital-based exercise program.

Therefore, action criteria of exercise program were set as the protocol of home-based walking program. Everyday home exercise consisted of 5 minutes warm up, 10-30 minutes walking, and 5 minutes cool down. Optimal exercise intensity was usually set at the heart rate of 20-25 beat above resting heart rate (approximately 60-70 HRmax). Dyspnea level should be evaluated by the patients. The patients should be trained to monitor his/her 1-minute radial pulse.

3.3 Nutrition taking

The quantity and quality of food intake is of critical importance for the recovery of health among cardiac surgery patients. Thirty five percent of cardiac

surgery patients reported loss of appetite (Beggs et al., 1998; Moore, 1996). Ten percent of them still have eating problem at 1 month following surgery. However, some patients needed to lose their weight therefore they do not pay much more attention in their eating problem (Moore, 1996). The patients felt that they had enough knowledge regarding heart healthy diet and when to begin that diet. Less than 15 % of the patients eat more fiber to prevent constipation after discharge (Fredericks et al., 2011). Some of the studies focused on secondary prevention diet which are low cholesterol and low sodium foods (Barnason, Zimmerman, Atwood, Nieveen, & Schmaderer, 2002; Barnason et al., 2003) while some studies focused on high fiber consumption and some studies did not provide the definition of diet change (Beggs et al., 1998; Gump et al., 2001; Moore, 1996).

In general, following cardiac surgery, patients are advised to eat a variety of foods and to eat healthy diet which is the foods that are low in total cholesterol, saturated fat and transfat. A food rich in whole grains, fruits and vegetables is also recommended. Specific nutrition issue for cardiac surgery patients are as follows:

a) Following cardiac surgery, patients should eat high carbohydrate and protein diet because it is important for wound healing and tissue development (University of South California Keck School of Medicine, 2011; Titler & Petti, 1995).

b) Cardiac surgical patients should consume diet to maintain 300 to 500 kcal above their basal metabolism rate (BMR) to promote wound healing (Cebeci & Celik, 2008; Titler & Petti, 1995). However, it is essential to regulate the total calorie intake of recovering patients to increase, decrease, or maintain the body weight as necessary (University of South Carolina Keck School of Medicine, 2011a).

c) Sodium intakes should be restricted following surgery because sodium can contribute to fluid retention, increasing the heart work. Daily sodium intake should be maintained between 2,000 to 3,000 mg to help reduce edema in the extremities (Cleveland Clinic, 2010), especially in CABG cases with vein harvesting (Artinan et al., 2002; Frantz & Walters, 2001).

d) Cardiac surgical patients should eat food high in fiber to prevent constipation (Fredericks et al., 2011).

e) Some patients may be individualized instructed to follow a low-sugar, low-calorie or low-sodium diet, depending on their medical condition such as Diabetes, hypertension, overweight, elevated cholesterol or triglyceride level, or renal disease (University of South Carolina Keck School of Medicine, 2011b).

Surgery related side effect such as loss of appetite has effects on dietary intake of the patients which may lead to weight loss, poor nutrition status and potentially compromise recovery from surgery. Currently, dietary advice literature mostly limited to the recommendations based on cardiovascular secondary prevention guideline. Meanwhile during recovery period, adequate food intake, especially for additional requirement for healing is important.

In summary, nutrition taking for cardiac surgical patients in this study was focus on the nutrition plan including eating high-protein, high-fiber, low-fat, low-salt, and low-sugar diets (Cleveland Clinic, 2010; STS, 2009).

3.4 Complication prevention

Now a day, cardiac surgical patients are sent home with a list of signs and symptoms to be continuously monitored. The patients should monitor signs and symptoms of cardiac arrhythmias by daily checking pulse for rate and rhythm (Cebeci

& Celik, 2008; Kranich et al., 2008; Mullen-Fortino & O'Brein, 2008). Signs and symptoms of wound infection including pain and tenderness, increased edema (swelling or puffiness) and redness, and a body temperature higher than 38.0° C should be routinely assesses by the patients, and they should contact their physicians if notice any abnormal signs and symptoms (Fredericks, 2006, 2009; Titler & Petti, 1995). In addition, the patients should monitor signs and symptoms of pulmonary complications including shortness of breath (Cebeci & Celik, 2008; Fredericks, 2006, 2009; Williamson, 2007).

Literature review showed that patients concerned about the incision wound care as the most important information for home recovery (Beggs et al., 1998). They also expressed good preparation for taking care of themselves about wound care, leg incision care, identifying signs and symptoms of infection, and whom to call with questions. However, less than 20% of the patients engaged in complication prevention and management behaviors such as cleaning and assessing incision wound, body weighing every day, reporting for abnormal signs and symptom of complication (Fredericks et al., 2011).

Complication prevention behavior in this study was focused on the prevention of the most seriously and life-threatening complication during 3-month recovery period. The criteria of behavior requiring for patients to take action on are consisted of the prevention of wound infection, arrhythmias, and heart failure after surgery (Fredericks et al., 2009).

3.5 Symptom management

Post cardiac surgery, patients may suffer from various symptoms. The most common problematic symptoms which were addressed in this study are incision pain,

constipation, and sleep difficulty (Fredericks, 2006; Schulz, Zimmerman, Pozehl, Barnason, & Nieveen, 2011; Theobold & McMaurray, 2004; Utriyaprasit & Moore, 2005). Patients following cardiac surgery should take medications as prescribed by healthcare professions to manage incision pain, constipation, and sleeping difficulty. Pain can also be effectively reduced by using non-pharmacologic strategies such as relaxation, music therapy, hot and cold therapy (Barnason, Zimmerman, Nieveen, et al., 2009; Fredericks, 2006, 2009; Mullen-Fortino & O'Brein, 2008; Titler & Petti, 1995; Williamson, 2007). Effective pain management enhances sleep and contributes to a reduction in fatigue (Fredericks, 2006; Schulz et al., 2011). Fatigue and dyspnea can by managed by scheduling activity and rest period during the day, and limiting the activities that are too hard (Fredericks & DaSilva, 2010; Schulz et al., 2011). In addition, patients can follow different techniques as advised by nurses to help for good sleeping.

Literature review reveals that most of the previous studies focused on pain management (Barnason et al., 2002; Beggs et al., 1998; Leegaard & Fagermoen, 2008; Moore, 1996). During the first 2 weeks after discharge, the patients did not use pain killer to manage their incision pain as recommended or did not take pain medication around the clock. Instead, they wait until pain went worse(Fredericks et al., 2011; Leegaard & Fagermoen, 2008). The patients emphasized that they were unable to remember all information they received before hospital discharge (Leegaard & Fagermoen, 2008).

Symptom management strategies for various symptoms used by CABG patients were reported (Schulz et al., 2011). This study reported symptom management the CABG patients used for fatigue, incision pain, sleep disturbance,

appetite problem, swelling, and shortness of breath during 6 weeks period following surgery. Even all patients received printed postoperative instruction for symptom management at the time of hospital discharge, approximately half of the patients use symptom management strategies for symptoms of shortness of breath, fatigue, and swelling. Whereas less than half of them reported using symptom management strategies for sleep problem, incision pain, and loss of appetite. Majority of the patients reported appropriated strategies; however, nearly half of them used some strategies that were not evidence based.

In summary, cardiac surgical patients should follows recommendation to use both medication and non-medication strategies to manage postoperative symptoms such as pain, constipation, and difficult to sleep (Dodd et al., 2001).

Literature review on nursing strategies to encourage the patients to perform these five important health behaviors during early recovery period was conducted. Major nursing intervention was patient education. Education were given alone (Lin, Tsai, Lin, & Tsay, 2010) or combined with other method such as peer support (Parry et al., 2009), counseling (Cebeci & Celik, 2008; Krummel et al., 2001), telephone follow up (Fredericks, 2009; Gortner & Jenkins, 1990; Parry et al., 2009). Methods used for information providing were booklet (Gortner & Jenkins, 1990; Lin et al., 2010), audiotape (Utriyaprasit & Moore, 2005), or technology assisted (Barnason, Zimmerman, Schulz, et al., 2009; Sherrard et al., 2009). Interventions were started preoperatively and continue periodically after hospital discharge (Cebeci & Celik, 2008; Krummel et al., 2001; Lin et al., 2010; Parry et al., 2009; Tung, Wei, & Chang, 2007), before discharge time (Fredericks, 2009; Gortner & Jenkins, 1990), or post

hospital discharge (Shepperd et al., 2013; Song & Lee, 2001). However, readiness to change concept was not found to apply by these studies.

4. Readiness to Change for Cardiac Health Behaviors

The stages of change construct from the TTM are used to explain RTC on cardiac health behaviors in this study. In TTM, each stage of change construct is defined based on the characteristics of behavior, intention, and time frames.

In this study, the stages of change were applied to the RTC on cardiac health behaviors during 3-month recovery period which was considered as short-term behavior. Because of the cardiac health behavior during recovery period following cardiac surgery consists of five key behaviors which were mentioned in earlier section. RTC regarding cardiac health behaviors were unable to be defined as a single construct. Instead it should be defined separately based on particular behaviors. Since previous studies supported that if there were more than one behavior to be changed, each behavior is different in its stage of readiness at a time (Cazes, 2005). Thus, individual's RTC on each behavior should be assessed separately.

The construct of RCT cardiac health behaviors, hence, was divided into five constructs which are:

1) Readiness to change for medication taking
2) Readiness to change for exercise
3) Readiness to change for nutrition taking
4) Readiness to change for complication prevention
5) Readiness to change for symptom management

The critical concern to the application of the TTM is that target behaviors to be changed should be specified because stages of readiness are behavioral specific (DiClemente, 2005). Action criteria for each behavior should be clearly indicated. After defining action criteria, work backward to evaluate attitudes and intentions that are represented by the first three stages of readiness(DiClemente, 2005).

A comprehensive literature review on cardiac health behaviors of the patients during 3-month recovery period following cardiac surgery was conducted. The action criteria of each behavior were clarified based on the literature review (Table 2).

Table 2 Action Criteria for Five Cardiac Health Behaviors

Behavior	Criteria to be classified as action
1. Medication taking	Taking all medications as prescribed by the physician with correct time, dosage, and frequency (Cramer et al., 2008).
2. Exercise	Following exercise protocol after surgery especially walking exercise that should be increased by 5 min /week until reach 30 minutes continuous walking, and pulse rate should be monitored before and after exercise (Chaivanichsiri, 2011; EACPR, 2010).
3. Nutrition taking	Following nutrition plan including eating high-protein, high-fiber, low-fat, low-salt, and low-sugar diets. (Cleveland Clinic, 2011: STS, 2009).
4. Complication prevention	Following recommendations to prevent his/her postoperative complications including wound infection, arrhythmias, and heart failure after surgery (Fredrick, Ibrahim, & Puri, 2009).
5. Symptom management	Using both medication and non-medication strategies to manage postoperative symptoms such as pain, constipation, and difficult to sleep (Dodd et al., 2001).

Definitions of RTC of each target behaviors were then given based on the SOC concept. The SOC was used to categorize the patients into 5 stages. However, since this study focused on the 3-month recovery period, thus maintenance stage

(make change on a new behavior for > 6 months) was omitted (J. O. Prochaska, personal communication, December 5, 2011). The RTC of each target behavior, thus, consists of 4 stages; precontemplation (PC), contemplation (C), preparation (PR), and action (A). Details are presented in Table 3.

Table 3 Operational Definitions of the Readiness to Change Each Target Behaviors

Behavior	Stage's attributes			
	Precontemplation	Contemplation	Preparation	Action
Medication taking	– No intention to take medication consistently after surgery – Unaware or under-aware that not taking medication consistently as prescribed can affect their recovery – No knowledge regarding postoperative medications that must be consistently taken in order to control postoperative complications such as cardiac arrhythmia, infection, or heart failure	– Thinks about how to take medication consistently but not taking them consistently right now – Knows that after heart surgery they should take medications as prescribed consistently but they unable to overcome obstacles – Has low confidence to get the better ways to be able to take medications consistently	– Plans to start taking medication consistently within 30 days – Seeks knowledge and strategies to be able to take medications consistently as prescribed – Has demonstrated some actions to help themselves to be able to take medication consistently – Trying to take medications consistently but occasionally forgets to take some medications or late taking	– Takes medication consistently as prescribed without missing any dose or making any change for < 3 months – Acknowledges effort to continue taking medications throughout recovery period
Exercise	– No intention to follow exercise protocol after surgery – Unaware or under-aware that not following exercise protocol can affect their recovery – No knowledge regarding postoperative exercise that help to regain heart function and promote recovery	– Thinks of following exercise protocol but do not follow the protocol right now – Knows that they should follow exercise protocol after surgery but unable to overcome obstacles – Has low confidence to get the better ways to be able to follow exercise protocol	– Plans to follow exercise protocol within 30 days – Seeks knowledge and strategies to be able to follow exercise protocol – Has demonstrated some actions to help themselves to be able to follow exercise protocol – Trying to follow exercise protocol but has never complete all recommendations	– Has followed exercise protocol for less than 3 months – Acknowledges effort to follow exercise protocol throughout recovery period
Nutrition taking	– No intention to follow nutrition plan after surgery – Unaware or under-aware that not following nutrition plan after surgery can affect their recovery – No knowledge regarding postoperative nutrition taking that help to promote recovery	–Thinks of following nutrition plan but do not follow the plan right now –Knows that after surgery they should follow nutrition plan but they unable to overcome obstacles –Has low confidence to get the better ways to be able to follow nutrition plan	– Plans to follow nutrition plan after surgery within 30 days – Seeks knowledge and strategies to be able to follow nutrition plan – Has demonstrated some actions to help themselves to be able to follow nutrition plan – Trying to follow nutrition plan but sometime deviate from the plan	– Has adhered to nutritional plan every day for less than 3 months. – Acknowledges effort to follow nutrition plan throughout recovery period

Table 3 (continue)

Behavior	Stage's attributes			
	Precontemplation	Contemplation	Preparation	Action
Complication prevention	– No intention to prevent postoperative complications – Unaware or under-aware that not taking action on prevention complications by themselves can affect recovery – No knowledge related to postoperative complications that usually occur during recovery period and (s)he has to pay attention in prevention of these complications	–Thinks of prevention postoperative complications by themselves but do not take any action –Knows that after heart surgery they should take action on prevention postoperative complications but they unable to overcome obstacles –Has low confidence to responsible for prevention postoperative complications	– Plans to take action on prevention postoperative complications within 30 days – Seeks knowledge and strategies to prevent postoperative complications – Has demonstrated some actions on prevention postoperative complications – Trying to follow recommendations for prevention postoperative complications but inconsistently perform	– Consistently follows recommendations for prevention postoperative complications for less than 3 months – Acknowledges effort to follow recommendation for prevention postoperative complications throughout recovery period
Symptom management	– No intention to manage postoperative symptoms after surgery – Unaware or under-aware that poor symptom management can affect their recovery – No knowledge that pain, constipation, and difficult to sleep are the major symptoms occurring during recovery from heart surgery and symptoms self-management can enhance smooth recovery	–Thinks of symptom self-management but do not start to do right now –Knows that they should take action on symptom management after surgery but they unable to overcome obstacles –Has low confidence to manage postoperative symptoms by him/herself	– Plans to start symptom self-management within 30 days – Seeks knowledge to use both medicine and non-medicine strategies to manage postoperative symptoms – Has demonstrated some actions on symptom self-management – Trying to use both medicine and non-medicine strategies to manage postoperative symptoms but sometimes rely on medication only	– Follow recommendations to use both medicine and non-medicine strategies to manage postoperative symptoms for less than 3 months – Acknowledges effort to use both medicine and non-medicine strategies to manage postoperative symptoms throughout recovery period

5. Instruments Measuring RTC for Cardiac Health Behaviors

The instruments to be developed in this study were guided by the SOC construct of TTM. Existing instruments which has been developed to measure RTC guided by the TTM were reviewed. Three major methods to measure RTC are discussed. Two methods, continuous method and readiness ruler, that are used in this study are discussed in depth. Examples of RTC measures of five behaviors relevance to this study are given.

The RTC can be assessed using three major methods: a discrete staging algorithm, a continuous measure, and a readiness ruler.

5.1 Existing instruments to measure RTC for cardiac health behaviors

5.1.1 A staging Algorithm This method assesses the stage from a series of mutually exclusive question. The answer consists of five items, one for each stage of change. The PC item is defined as having no intention to begin target within the next 6 months. The C item is defined as intending to begin target behavior within the next 6 months. The PR item is defined as intending to begin target behavior within 1 month. The action item is defined as regularly performing target behavior, but for less than 6 months. The respondents were asked to choose one of the five items which is most reflective of their current behavior and assigned to a stage based on their response.

Staging algorithm has practical advantage of being short and simple, thus this method is frequently used in clinical practice (Norcross et al., 2011). Staging algorithms rely heavily on arbitrary temporal cut-off timeframes. In addition, as the use of algorithms remains unstandardized, psychometric evaluation is difficult.

Empirical evidence regarding the validity of these measures in cardiac relevant behaviors (e.g. diet, smoking cessation, exercise, nutrition, medication taking etc.) is mixed (Adams et al., 2006; Cazes, 2005; Sneed & Paul, 2003; Spencer et al., 2006). All of these factors have the potential to significantly reduce the clinical utility of staging algorithms in cardiac populations.

5.1.2 A continuous method A multiple-item questionnaire was used as a continuous method. Score obtained from the questionnaire will be used to classify individual into a stage of readiness. Several questionnaires were developed to assess RTC across a variety of health behaviors. The University of Rhode Island Change Assessment (URICA) is an earliest continuous method scale (McConnaughy, Prochaska, & Velicer, 1983). The URICA consists of 32 items representing an individuals' attitudes and behaviors with respect to four SOC (PC, C, A, and maintenance). The answer of each item will be rated using 5- point Likert scale (1= strongly disagree, 2 = disagree, 3 = undecided or unsure, 4 = agree, and 5 = strongly agree). A PR stage was not included because psychotherapy patients on which the measures were developed cannot differentiate PR from C and A. Stage of change is determined through cluster analysis that place individuals into homogenous groups on the basis of their patterns or profiles of scores on the URICA dimensions. The score is calculated by summing total score and subtract score of PC subscale. Ranges of the total score were provided to allocate respondent into stage of readiness (McConnaughy, DiClemente, Prochaska, & Velicer, 1989; McConnaughy et al., 1983). Items refer to generically a person's "problem" rather than a specific behavior. The URICA has been applied to different behavioral area such as medication compliance (Johnson et al., 2006), exercise (Reed, Velicer, Prochaska, Rossi, &

Marcus, 1997), smoking (Amodei & Lamb, 2004), condom use (Evers, 1998), and anxiety management (Burditt, 2011).

A continuous method is longer than staging algorithm but has advantages of being more subtle and less susceptible to misreporting in context (Littell & Girvin, 2002). Scales using continuous methods was tested and found that the participant responses were not affected by social desirability bias (Hodgin, 2001; Nielson, Jensen, & Kerns, 2003).

5.1.3 The readiness ruler This scale is a 0-10 rating scale developed for use in clinical setting since 1995 (Stott, Rollnick, Rees, & Pill, 1995). It has been used in training setting and is recommended for use in clinical setting. No study was conducted to test psychometric properties of this ruler. Until 2005, Labrie and collogues modified the readiness ruler to assess stages of readiness for alcohol consumption and safe sex behaviors.

Literature review shows that the readiness ruler has acceptable convergent validity compared to readiness to change questionnaire and outcome criteria (Chung et al., 2011; Harris, Walters, & Leahy, 2008; Heather et al., 2008; Heese, 2006; LaBrie et al., 2005; Maisto et al., 2011; Naar-King et al., 2006). However, reliability evaluation of the readiness ruler has never been found in previous studies.

5.2 RTC measures appropriate for Thai cardiac surgical patients

Among three formats of RTC measures, a staging algorithm is widely used in clinical setting while continuous measure is preferred in research area (Norcross et al., 2011). However, algorithm method seems to force the respondent into one stage of

RTC by choosing only one answer. The use of algorithms may be questionable because of the psychometrically limited. Empirical evidence regarding the validity of this measure in cardiac health behavior domains is mixed (Adams et al., 2006; Cazes, 2005; Napper, Branson, Fisher, Reynolds, & Wood, 2008; Sneed & Paul, 2003; Spencer, Wharton, Moyle, & Adams, 2007). In addition, the accuracy of an algorithm method is limited by the social desirability. The questionnaires using continuous measure are long. However, their reliability and validity is widely supported. Questionnaire using continuous method was tested as free from social desirability bias (Nielson et al., 2003). The readiness ruler is short, easy to use, and more familiar to the patients since it looks like the numerical pain scale which widely used in cardiac surgical context in Thailand.

In the present study, two format scales to measure RTC; the continuous measure and the readiness ruler, were developed. It is hoped that the continuous measures could serves as a valid and reliable instrument using in research area, whereas, the ruler will be proved to be an instrument of choice for the clinical setting that demand a shorter staging instrument. Given the complexity of SOC construct as well as behaviors related to cardiac surgical recovery, it is not yet clear whether a simple readiness ruler can entirely capture participant's readiness. Hence, the continuous method will be used as a comparison measure as well.

There are many instruments measuring RTC behavior using continuous method and readiness rulers (Littell & Girvin, 2002; Prochaska et al., 1994; Sutton, 2005; Tillis et al., 2003); however, there is no instrument measuring RTC for five behaviors related to postoperative recovery among cardiac surgical patients. Instruments measuring RTC in other populations were reviewed and evaluated

according to conceptual basis, item content, psychometric properties evidence, scale format, and scoring method.

The first instrument is the readiness for behavioral change in HF patients scale developed by Sneed and Pual (2003). This instrument measures readiness for six behaviors (dietary sodium restriction, fluid intake restriction, exercise regularly, quit smoking, quit alcohol, and losing weight). The instrument consisted of a single-item algorithm with 5 response items corresponding to each stage of change. They classified RTC across each relevant health behaviors and found that the majority of patients reported being in action and maintenance stages. Essential psychometric properties such as construct validity, content validity, and other reliabilities have not been reported. The authors reported the predictive validity of the measure as weak and noted that there may be an increased influence of social desirability on the findings.

The second instrument is the Heart Failure Readiness for Behavioral Change Scale (HF-RBCS) developed by Cazes (2005). This instrument was further adapted from the study of Sneed & Paul (2003). The HF-RBCS measures readiness of six behaviors (medical compliance, sodium restriction, regular physical activity, weight monitoring, smoking cessation, and alcohol cessation) which were different from the previous study. Using algorithm method, RTC on each behavior was measured by 1 item, and six answer choices indicated stages of readiness (termination stage was added). Content validity of this scale was 1.00. Test-retest reliability was tested in 31 HF patients, in 2-week period. The results of test-retest reliability were .69 for medical compliance items, .99 for sodium restriction items, .95 for regular physical activity items, .92 for weight monitoring items, .92 for smoking cessation items, and .92 for alcohol cessation items. Construct validity of this scale was tested by

confirmatory factor analysis, but fair result was reported. The results reveal that HF patients were in different RTC stages among six behaviors.

The third instrument is the Readiness to Change scale (RTC) for HF patients (McKibbin et al., 2007). The scale developers pointed out that even the HF-RBCS can classify patients regarding their readiness, but social desirability may effects on the honest answer because of the use of algorithm format. The RTC for HF was developed by an adaptation from the Pain Stage of Change Questionnaire (Kern, Rosenberg, Jamison, Caudill, & Haythornthwaite, 1997) which is a continuous measure. The RTC for HF consists of 20 items measuring 6 stages of readiness (precontemplation 3 items, contemplation 4 items, preparation 2 items, action 5 items, maintenance 5 items, and resistance 1 item). The answer were rated on 5-point Likert scale (1=strongly disagree to 5=strongly agree). Principle component analysis was used to test construct validity and the result confirmed 6 factors. Internal consistency of the scale varied from .16 (contemplation) to .81(maintenance). Even validity and reliability of this scale are acceptable, it was tested in small sample size (n=116). Moreover, content details of each item are not specific to any behavior. It seems to measure RTC in general. Item content cannot be modified for this study.

The fourth measure is the Pain Stages of Change Questionnaire (PSOCQ) developed to assess patients' readiness to adopt a self-management approach to chronic pain (Jensen, Nielson, Romano, Hill, & Turner, 2000; Kern et al., 1997). The PSOCQ consists of 30 items incorporated to four stages (PC 7 items, C 10 items, A 6 items, M 7 items). The questionnaire was based on a 5-point Likert type scale from 'strongly disagree' (1) to 'strongly agree' (5). Each patient was classified into one of four stages based on his or her highest PSOCQ scale score. When the patients had

two or more scale scores that were equal, they were arbitrarily placed into the `higher' of the two stages. This scale has good internal consistency with Cronbach's alpha ranged from 0.75 to 0.88 (Jensen et al., 2000).

The fifth instrument is the University of Rhode Island Change Assessment Scale (URICA; McConnaughy et al., 1983). The URICA is a 32-item, internally consistent (α = .69 to .89) and temporally stable measure that yields four summary scores corresponding to Precontemplation, Contemplation, Action, and Maintenance (McConnaughy et al., 1989; McConnaughy et al., 1983). The URICA was originally developed for use with psychotherapy clients, items refer to a person's "problem" rather than any specific behaviors. In early development, URICA has 4 factors. After that, in 1991, it was discovered contemplation stage has been subdivided to create a preparation stage, as was proposed in TTM (DiClemente et al., 1991). People in preparation stage score high on both the contemplation and action subscales (Prochaska & Norcross, 2001). The alpha reliabilities of the URICA were: PC 0.69; C 0.75; A 0.82; and M 0.80. To obtain the RTC score, first calculate the mean score for each subscale (PC, C, A and M). Then sum the means from the C, A, and M subscales and subtract the PC mean (C + A + M - PC = Readiness). Norm reference score is provided for staging. The users can then compare the computed RTC score with the norm reference score to allocate respondent in a correct stage.

The sixth instrument is the University of Rhode Island Change Assessment for Exercise (URICA-E2). The URICA-E2 is a third generation scale developed based on the URICA to assess RTC for exercise (Reed, 1995). The URICA-E2 added the fifth stage, Preparation (PR), to the four stages of the URICA. This scale consists of 24 items with 5-point Likert response as in the URICA. While the URICA developed

to measure the readiness to stop problematic behaviors, each items of the URICA-E2 were written to capture intention and behaviors of individual to adopt exercise behavior. Principle component analysis and confirmatory analysis confirmed six factors model which PC stage was divided into two sub-groups; Non-Believers (PC-NB) and Believers (PC-B). Individuals of these two sub-groups, however, are perceived as not having plans for exercise within the next 6 months. The alpha reliabilities of the URICA-E2 were: .81 for PC-NB; .91 for PC-B; .91 for C; .88 for PR; .92 for A; .94 for M stage.

The seventh measure is the Readiness to Change Questionnaire (RTCQ) which was developed to examine RTC alcohol drinking behavior (Rollnick, Heather, Gold, & Hall, 1992). The RTCQ composed of 12 items representing 3 stages of change (PC, C, and A). Each stage subscale consisted of 4 items. Principle component analysis confirmed 3 factors. Cronbach's alphas of the scale were .73 for PC, .80 for C, and .85 for A subscale. Test-retest reliability was conducted in 1 or 2 days period. Correlations between two administers were .82 for PC, .86 for C, and .78 for A scale. In calculating scale scores, response points for items were deemed to run from -2 (strongly disagree) to + 2 (strongly agree). The range of each scale was therefore -8 to + 8. Allocation of subjects to one of the stages of change was based initially on the highest raw score obtained among the three scales. In the event of a tie between two scale scores, the one farther along the continuum of the stages of change was chosen, on the ground that this must be assumed to be the farthest point reached in the change process. An alternative method for allocation subjects to a stage of change is using standardized scores (i.e. Z-scores with a mean of zero and SD of unity) for each scale rather than raw scores. When allocation to stage of change was

based on the highest standardized score obtained by the subject, the proportion of subjects assigned to PC was increased and the proportion assigned to the C stage was decreased. This was a consequence of the relatively lower mean of raw scores for the PC scale and the higher mean for C scale scores in their study (Rollnick et al., 1992).

The first two scale using staging algorithm to classify HF patients into stage of RTC among multiple behaviors. Scale format will not be used in the present study. However, the variation of patients' stages among behaviors confirmed that individual is in different stages of RTC for multiple behaviors. The RTC for each behavior should be separately assessed. Thus current study will develop five scales to measure RTC for medication taking, exercise, nutrition taking, complication prevention, and symptom management.

The later five measures provide the item and response format information to develop the new scales in this study. Some items from the URICA-E2 will be modified for the new scales. Further, three different scoring methods were compared: the cut-off point method; the highest raw score; and the highest standardized score method. Since this is a newly scale development study, it is impossible to get cut-off point score. Scoring method as use in the URICA is not suitable. The highest raw score method is based on the average highest raw score on each subscale. If participant shows equally high scores in two or more subscales, he or she is considered to belong to the most progressed stage. Another scoring method is that individual will be allocated into the stage based on the highest standardized score of the subscale. This scoring rule is suggested by several studies (Kern et al., 1997; Nielson et al., 2003).

In the present study, scoring using standard T-score was chosen because using standard score, the differences between the distributions of raw scores on all subscales are taken into account (Rollnick et al., 1992). If more than one stage are rated equally high, participants will be assigned to the more advanced stage. This criterion is on the basis that individual must be assumed to be in the farthest point reached in the change process (Rollnick et al., 1992). For example, if scores are equal on preparation and action, this participant would be in action stage of readiness.

6. Scale Development

Development of scale to measure construct of interest is a vital aspect of nursing science. Most of the time, nursing profession deals with the constructs that cannot be assessed directly. Measurement, an assignment of the numbers to aspects of objects or event according to rules (Duncan, 1984), then plays an important role in nursing science.

This section provides a guideline for the development of scales in accordance with psychometric properties evaluation principles for scale development research. DeVillis (2012) suggests eight steps to develop measurement scale which are: 1) determine what you want to measure; 2) generate an item pool; 3) determine the format for measurement; 4) have initial item pool reviewed by experts; 5) consider inclusion of validation items; 6) administer items to a development sample; 7) evaluate the items; and 8) optimize scale length. Scale development process purposed by Hinkin (1998) consists of 1) item generation; 2) questionnaire administration; 3) initial item reduction; 4) confirmatory factor analysis; 5) convergent/discriminant validity; and 6) replication. Step 1- 3 of Hinkin's guideline is consistent with step 1-8 of DeVillis's guideline. Step 4 – 6 of Hinkin's guideline provides psychometric

properties testing of the newly developed scale. Merge together, scale development process and psychometric properties evaluation for the new scale consists of two major phases: phase 1 involves step 1-8 of DeVillis (2012) or step 1-3 of Hinkin (1998), and phase II involves step 4-6 of Hinkin (1998).

Phase I This phase consists of three steps which are generating item pool, content validity assessment, and pilot testing.

1. Generating item pool The first step of scale development is a creation of items to assess the construct of interest. A well-articulated theoretical foundation is required to indicate the content domain for the new scale. At this point, the goal of is to develop items that will result in scales that sample the theoretical domain of interest to demonstrate content validity. Domain sampling theory indicates that it is not possible to measure the complete domain of interest, but it is important that the sample of items drawn from potential items adequately represents the construct under examination (Hinkin, 1998).

Once the purpose of the scale has been clarified and construct of interest has been well operationalized defined, the researcher is ready to begin generating a large pool of items. These items should be created with the specific goal. All items make up a homogeneous scale and content of each item should reflect the construct of interest. Statements should be simple and short. The language used should be easy to understand and familiar to target respondents. At this stage, redundancy is preferable (DeVellis, 2012). Redundancy items express a similar idea in somewhat different ways. Items should be redundant with respect to the construct of interest but not to their grammatical structure and incidental vocabulary. Relevance redundancies will yield more reliable item sets (DeVellis, 2012).

Number of items is difficult to set out for initial item pool. In general, the larger the item pool, the better. The more items in the initial item pool, the fussier researcher can be about choosing ones that will measure the construct intended to be measured. The initial item pool may be ≥ 50% larger than the final scale was suggested (DeVellis, 2012).

Determining format for the scale is a step that usually occurs simultaneously with item generating process. Scales made up of items that are scorable and are summed to yield a scale score. Traditional aspect of scaling involves four levels of measurement which are; nominal, ordinal, interval and ratio (Nunnally & Bernstein, 1994). Nominal scales contain rules for deciding whether two objects are equivalent or not equivalent. The numbers of nominal scale are assigned to differentiate things, without implying to any mathematical value. Ordinal scale involves rules for deciding whether one object that is unequal to another is greater than or less than in regard to a given attribute. The numbers assignment gives the rank-order properties of the data. Interval scales (equal interval scales) reflect operational that define a unit of measurement as greater, equal, and less than. Properties of the interval scales are: 1) the rank ordering of objects on an attribute is known; 2) the distances among objects on the attribute are also known; and 3) the absolute magnitudes of the attribute are unknown. A ratio scale is an interval scale with a true zero. A rational zero means absence of the attribute. The presence of a meaningful zero makes ratios of any two measures meaningful. Addition, subtraction, division, and multiplication can be used with individual values defined on ratio scales.

There are several scaling techniques available. Some common formats are discussed below.

Thurstone scaling In an attempt to approximate an interval level of measurement, Robert Thurstone developed the method of equal-appearing intervals. This scaling format was developed in that the strength of the individual items is taken into account in computing the attitude score. Each item has a numerical value indicating the individual's attitude about the specific issue, either favorable or unfavorable. Items are developed corresponding to different intensities of the attribute, spaced to represent equal interval, and formatted with agree-disagree response option.

Guttman scaling. A Guttman scale is a series of items tapping progressively higher level of an attribute. A respondent should endorses a block of adjacent items until, at a critical point, the amount of the attribute the items tap exceeds that possessed by the subject. None of the item should be endorsed. A respondent's level of the attribute is indicated by the highest item yielding an affirmative response. Whereas both Thurstone and Guttman scales are made up of graded items, the focus is on a single affirmative response in the former case but on the point of transition from affirmative to negative responses in the latter case. Guttman scales works well in situations where it is a logical necessity that responding positively to one level of a hierarchy implies satisfying the criteria of all lower level of that hierarchy. Thurstone and Guttman scales have their place but their applicability seem limited. Both approaches have advantages; however, their difficulties outweigh advantages. The measurement theory, in general, cannot be applied to these types of scales. The assumption of equally strong relationship between the latent variable and each of the items would not apply to Thurstone or Guttman scale items (DeVellis, 2012).

Likert scaling With respect to scaling the items, it is important that the scale used generate sufficient variance among respondents for statistical analyses (Hinkin, 1998). Likert-type scales are the most frequently use and the most useful in behavioral research. They also are most suitable for factor analysis. With Likert scale, the item is presented as a declarative sentence, followed by response options that indicate varying degree of agreement. Odd or even number of response depends on the phenomenon being investigated. The response option should be worded to have roughly equal intervals with respect to agreement. Thus, the difference in agreement between any adjacent pair of response should be about the same as for any other adjacent pairs of response. Comparing of 7-point, 9-point, and 5-point Likert scale, it was found that coefficient alpha reliability has been shown to increase up to the use of five points. Accordingly, it is suggested that the new items be scaled using 5-point Likert-type scales (Hinkin, 1998).

2. Content validity assessment After items have been generated, they are subjected to an assessment of content validity. This process served as an initial test, permitting the deletion of items that are deemed to be conceptually inconsistent. Content validity refers to the degree to which a sample of items, taken together, constitute an adequate operational definition of a construct (Polit & Beck, 2006).

In regard to the selection of content experts, relevant training, experience, and qualifications of content experts are of concerned. If a clear theoretical basis for instrument development is well defined, a criterion for selection of content experts might be expertise related to the conceptual framework. A history of publications in peer-review journals usually provides expertise area of the experts. National presentation and research on the phenomenon of interest may be another one

criterion in selecting content experts. Suggestion on numbers of the number of content experts is vary. Lynn (1986) suggested a minimum of 3 content experts, but others recommend from 2 to 20 panel members.

Expert assessment is achieved quantitatively and qualitatively. Qualitative data can be used for enhance content validity of a scale for providing suggestion for rephrasing or supply new items. Quantitative assessment is express by content validity index. Content validity can be examined at the level of the entire scale and at individual items. Content validity at the scale level expresses how well the subscales represent the content domain being measured. Content validity at the item level expresses the extent to which each item measures the content domain, which it is supposed to measure (Lynn, 1986). To calculate an item-level CVI (I-CVI), experts are asked to rate the relevance of each item, usually on a 4-point scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). Then, for each item, the I-CVI is computed as the number of experts giving a rating of either 3 or 4, divided by the number of experts which represent the proportion of agreement about relevance. An acceptable I-CVI should be relevant to the number of experts. If there are five or fewer experts, the I-CVI must be 1.00. Researchers use I-CVI information to guide the revising, deleting, or substituting items.

As for scale-level content validity (S-CVI), there are two major approaches to compute the S-CVI. One approach is universal agreement among experts (S-CVI/UA), defining the S-CVI as the proportion of items on an instrument that achieved a rating of 3 or 4 by all the content experts. Another approach is to compute the I-CVI for each item on the scale, and then calculate the average I-CVI across items. This approach called S-CVI/Ave (Polit, Beck, & Owen, 2007). The S-CVI/Ave

means the average proportion of items rated as 3 or 4 across the various judges. The S-CVI/Ave can be calculated by summing I-CVIs and dividing by the number of items. It is best to conceptualize the S-CVI/Ave as the average I-CVI value because this puts the focus on average item quality rather than on average performance by the experts. It demands a higher standard for the S-CVI/Ave than for an S-CVI/UA. The S-CVI/Ave should be .90 or higher is suggested as acceptable level (Polit & Beck, 2006; Waltz, Strickland, & Lenz, 2010).

3. Pilot testing Scale items which survive the content validity assessment will be used to measure the construct under investigation. First draft of the newly developed scale is consisted of acceptable content validity items. In this stage, first draft of the scale should now be administered to a sample representative of the actual population of interest (Hinkin, 1998). Pilot study is conducted to evaluate the performance of individual item. Initial reliability, item analysis and exploratory factor analysis usually perform during this phase. Not only the representativeness, but sample size should also large enough for these statistical test.

Use of large samples provides obtaining stable estimates of the standard errors to assure that factor loadings are accurate reflections of the true population values. Recommendations for item-to-response ratios range from 1:4 to 1:10 for factor analysis (Hinkin, 1998). In most case, a sample size of 150 cases should be sufficient to obtain an accurate solution in exploratory factor analysis as long as item intercorrelations are reasonably strong (Hinkin, 1998; Johanson & Brook, 2010).

Once data obtained from a pilot sample is analyzed, results are then be used for initial item reduction and to further refine the new scales. Exploratory factor analysis allows the reduction of poor performance items. It also provides a

parsimonious representation of the original set of item. The principal-components method of analysis mixes common, specific, and random error variances, thus a common factoring method such as principal axis is recommended (Hinkin, 1998; Nunally & Bernstein, 1994).

Prior to conducting the factor analysis, it is recommended to examine the interitem correlations, and item-to total correlations. The correlation at less than .4 with all other variables may be deleted from the analysis. A key assumption in the domain sampling model is that all items belonging to a common domain should have similar average intercorrelations. Low correlations indicate items that are not drawn from the appropriate domain and that are producing error and unreliability.

The number of factors to be retained depends on both underlying theory and quantitative results. The researcher should have a strong theoretical justification for determining the number of factors to be retained, and the examination of item loadings on latent factors provides a confirmation of expectations. Eigenvalues of greater than 1 and a scree test of the percentage of variance explained should be used to support the theoretical foundation. If the items have been carefully developed, the number of factors emerged should equal to the number of scales being developed. The intent is to develop scales that are reasonably independent of one another, so an orthogonal rotation is recommended for exploratory factor analysis.

The parsimony and simple structure are preferred for the scale, the researcher should retain only items that clearly load on a single appropriate factor. The objective is to identify items that most clearly represent the content domain of the underlying construct. There is no rule for this, but the criterion of .40 is commonly used in selecting factor loadings as meaningful. It is useful to examine the communality

statistics to determine the proportion of variance in the variable explained by each of the items, retaining the items with higher communalities. The percentage of the total item variance that is explained is also important. The larger the percentage shows the better item. There are no rigid guidelines, but 60% could serve as a minimum acceptable level. At this stage, inappropriately loading items can be deleted, and the analysis repeated, until a clear factor structure matrix that explains a high percentage of total item variance is obtained.

Initial reliability of the scale also evaluated in the pilot study stage. Internal consistency reliability using Cronbach's alpha is also recommended when used in conjunction with factor analysis. At this step, the internal consistency reliabilities for each of the new scales is calculated. A large coefficient alpha of .70 is suggested as an indication of strong item covariance and the sampling domain has been captured adequately (Nunnally & Bernstein, 1994). If the number of retained items at this stage is sufficiently large, the researcher may want to eliminate those items that will improve or not negatively affect the reliability of the scales (Hinkin, 1998). Most statistical software packages produce output that provides reliabilities for scales with individual items removed. At this stage, it is possible to retain those items that contribute to the internal consistency reliability and adequately capture the sampling domain.

Main result of pilot study is a second draft of scale which composed of the items that best representative of the construct to be measure. At this time, the second draft scale should be evaluated for psychometric properties.

Phase II In this phase, validity and reliability of the newly developed scale will be evaluated. All scales developed to measure construct of interested are

expected as perfectly tool to obtain true score. However, no scales are perfect. All measurement contains the possible of error; therefore actually obtained scores are somewhat different from true scores. The difference between true and obtained scores is called error of measurement.

In general, psychometric property testing of the scale is utilized to find out the quality of the instrument. Broadly, quality of the scale can be evaluated by its validity and reliability. Validity means the extent to which an instrument accurately measures what it purports to measure (Nunnally & Bernstein, 1994). Validity can be decrease because of systematic errors, which are predictable error of measurement. They usually occur in one direction, consistently over or under estimating the true scores. Systematic error contributes to the score of all subjects equally and thus test values are not truly representations of the quantity of attributes to me measured.

Reliability refers to the repeatability, reproducibility, stability, dependability, consistency, or predictability of measurements. It may also be defined as the proportion of variance attributable to the true score of the latent variable (DeVillis, 2012). Reliability of measures can be attenuated by random errors, which are due to chance and can affect a subject's score in an unpredictable way. Random errors limit the degree of precision in estimating the true scores from obtained scores and lead to ambiguous measurement.

Validity There are three essential types of validity; content, construct, and criterion-related validity. Each type is reviewed briefly.

1. Content validity concerns item sampling adequacy which is the extent to which a specific set of items reflect a content domain (DeVillis, 2012). Content validity is intimately link to the operation definition of the construct to be measured.

Simply state that scale content should reflect operational definition of the scale. There is no objective method to assess the adequate content validity. Experts to the content area usually called upon to evaluate the adequacy of item content. Both qualitative and quantitative evaluation give their unique useful for development of content validity scale. Content validity index is a widely use criteria for content validity assessment. Detail of content validity assessment was provided in phase I study section.

2. Construct validity is the extent to which a measure behaves the way that the construct it purports to measure should behave with regard to established measures of other construct (DeVillis, 2012). The significance of construct validity is in its linkage with theory and theoretical conceptualization. Construct validity can be examined by known-group technique, hypothesis testing approach, multitrait-multimethod approach, and factor analysis.

In the known-groups approach, the investigator identifies two groups of individuals who are known to be extremely high and extremely low in the characteristic being measured by the instrument. The instrument is then administered to both the high and low groups, and the differences in the scores obtained by each are examined. If the instrument is sensitive to individual differences in the trait being measured, the mean performance of these two groups should differ significantly (Waltz et al., 2010).

Hypothesis testing approach, the investigator uses the conceptual framework underlying the measure's design to state hypotheses regarding the behavior of individuals with varying scores on the measure, gathers data to test the hypotheses, and makes inferences on the basis of the findings regarding whether the

rationale underlying the instrument's construction is adequate to explain the data collected. If the theory or conceptual framework fails to account for the data, it is necessary to (1) revise the measure, (2) reformulate the rationale, or (3) reject the rationale altogether.

Multitrait-multimethod approach uses the concept of convergence and discriminability. Convergence refers to the evidence that different methods of measuring a construct yield similar results. Convergent validity is achieved when the correlations between measures of similar constructs using different methods (monotrait-heteromethod) are significantly different from zero and sufficiently large (Hinkin, 1998). Discriminability refers to the ability to discriminate the construct being measured from other similar constructs.

If the researcher hypothesized about the number of factors, internal structure of the new measure, factor analysis is useful approach to study the construct validity of the instrument. Factor analysis assesses the degree to which the individual items on a scale truly cluster together around one or more dimensions. If evidence for construct validity exists, the number of factors resulting from the analysis should approximate the number of dimensions or subcomponent assessed by the measure. Item designed to measure the same dimension should load on the same factor, whereas those designed to measure different dimensions should load on different dimensions (Nunnally & Bernstein, 1994).

Two common approach of factor analysis are exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is a technique that decomposes the variance of a measure into variance that is shared by the items (common factors) plus variance that is not shared. The outcome of this process is the

identification of a group of linear combinations of the items that are called *factors.* These underlying factors are defined in mathematical terms so the process is considered data-driven. In contrast, CFA approach allows the researcher to use theoretical knowledge in testing the construct validity of the instrument. The intent of CFA is to hypothesize or define the factors directly and then determine how well the defined measurement model fits the observed data. CFA, then, is theory-driven rather than data-driven (Waltz et al., 2010). A computer program such as LISREL provides a technique allowing the researcher to assess the quality of the factor structure by statistically testing the significance of the overall model and of item loadings on factors. In scale development, it is recommended that confirmatory factor analysis be conducted using the item variance-covariance matrix computed from data collected The purpose of the analysis is twofold. First, to assess the goodness of fit of the measurement model comparing a single common factor model with a multitrait model with the number of factors equal to the number of constructs in the new measure (Joreskog & Sorbom, 2002). The multitrait model restricts each item to load only on its appropriate factor. The second purpose it to examine the fit of individual items within the specified model using the modification indices and t values.

As a test of the overall model fit, chi-square statistic (χ^2) tests whether the model- implied covariance matrix is consistent with the sample covariance matrix. The goal is to accept the null hypothesis that our model is consistent with the data versus the alternative that it is not consistent. There are some reasons for using caution with the χ^2 test, however. Multivariate skewness can result in a large χ^2 statistic that would lead to rejection of the null hypothesis. With large sample, small differences between the actual and implied covariance matrices can be magnified,

leading to a significant χ^2 test statistic. The recommendation is to look at the χ^2 / df ratio with the goal of having the ratio be less than 3.0 (Joreskog & Sorbom, 2002; Waltz et al., 2010). Other fit indices are less sensitive to sample size. One common index is the *Goodness-of-Fit Index* (GFI) that indicates the proportion of observed covariances explained by the model implied covariances. The *Adjusted Goodness-of-Fit Index* (AGFI) adjusts for the complexity of the model. These indices range from 0–1 with values more than 0.90 recommended, preferably 0.95 or greater. Another useful measure is the *Normed Fit Index* (NFI) which is based on the difference of the χ^2 value for the proposed model to the χ^2 value for the independence model. Although there are no strict guidelines for what supports the model, values greater than 0.95 are desired. Researchers should report more than one of the fit indices to support the fit of the hypothesized model.

3. Criterion-related validity exists when the results of the instrument being evaluated are similar to those from highly-regarded external instrument, or a gold standard. There are two types of criterion-related validity; concurrent validity, and predictive validity. Concurrent validity refers to the ability of an instrument to distinguish individuals who differ in their present status on some criterion. Predictive validity refers to the degree to which an individual's future level of performance on a criterion can be predicted from knowledge of performance on a prior measure (Waltz et al., 2010). Activities undertaken to obtain evidence for criterion-related validity include: (1) correlation studies of the type and extent of the relationships between scores and external variables; (2) studies of the extent to which scores predict future behavior, performance, or scores on measures obtained at a later point in time; and (3) studies of the effectiveness of selection, placement, and/or classification decisions

on the basis of the scores resulting from the measure (Waltz et al., 2010).

Reliability Reliability concerns the extent to which measurements are repeatable-when different person make the measurement, on different occasions, with supposedly alternative instruments for measuring the same thing and when there are small variations in circumstances for making measurement that are not intended to influence results (Nunnally & Bernstein, 1994). It is the extent to which the instrument gives the same results on repeated measures. Another way to define reliability is in terms of accuracy. An instrument can be said to be reliable if its measures accurately reflect the true scores of the attribute under investigation. By conceptual view, researchers can compute reliability as ratio of estimated true score to the observed score. True score = observed score – error; thus:

$$\text{Reliability} = \frac{\text{True score}}{\text{Observed score}}$$

There are several ways to measure reliability, only reliability test that applied to the present study are discussed. These reliability tests are internal consistency and test-retest reliability.

Internal consistency or homogeneity describes estimates of reliability based on the average correlation among items within the instrument (Nunnally & Bernstein, 1994). When subjects answer consistently across items within the instrument, it refers to item homogeneity. In order for items of a measure to be homogenous, they must measure the same characteristic. The items must also be well written and free of technical flaws that may cause subjects to respond on some basis unrelated to the content. Even if items are fair representatives of the content domain, but some are

poorly written, thus subjects may misinterpret the questions. This will lower internal consistency. The internal consistency coefficient is an index of both item content homogeneity and item quality. Cronbach's alpha is one of the most favorable internal consistency coefficients. It assesses the extent to which the items on an instrument correlate with one another (Ferketich, 1991).

Test-retest reliability or stability refers to the extent to which the same results are obtained from repeated administration of the instrument. Measurement errors of primary concern are the fluctuations of a subject's obtained scores around the true scores because of temporary changes in the subject's state. Errors as a result of administration, scoring, guessing, mismarking, or others may have an impact on obtained score. The test-retest reliability coefficient estimates the impact of such errors on test scores reliability. The test-retest approach is suitable for determining the quality of measures designed to assess characteristics known to be relatively stable over the time period under investigation.

In the present study, five RTC questionnaires and readiness rulers were developed based on the scale development process suggested by DeVillis (2012) and Hinkin (1998) as described above. In regard to the psychometric properties of scales, RTC questionnaire were tested for content validity, construct validity (CFA), and internal consistency reliability. Readiness rulers were tested for content validity, construct validity (convergent validity), and test-retest reliability. Detail of the development procedure and psychometric properties testing are presented in the next chapter.

CHAPTER III
METHODOLOGY

Aims of this study were to develop and demonstrate psychometric properties of five RTC questionnaires and the readiness rulers. The following sections discuss the methodology of this study.

Population and Sample

Population of this study was Thai patients who underwent cardiac surgery within 3 months. Sample was the patients who met the following inclusion criteria: (1) age ≥ 18 years; (2) undergone cardiac surgery (CABG, valve surgery, or septum defect closer surgery) within 3 months; and (3) able to communicate in Thai.

Sampling Method

Information regarding number, geographical area, and volume load of the hospitals performing cardiac surgery in Thailand was retrieved from the Society of Thoracic Surgeons of Thailand's database. The multi-stage sampling technique was applied to obtain the participants. Thailand was divided into 4 geographic regions—North, Northeast, Central & Bangkok, and South. Then, seven hospitals with high-volume cardiac surgery procedure from each region were selected (Figure 1). Participants were recruited from outpatient department and cardiac surgical wards of selected hospitals. Convenience sampling technique was used to obtain participants during study period.

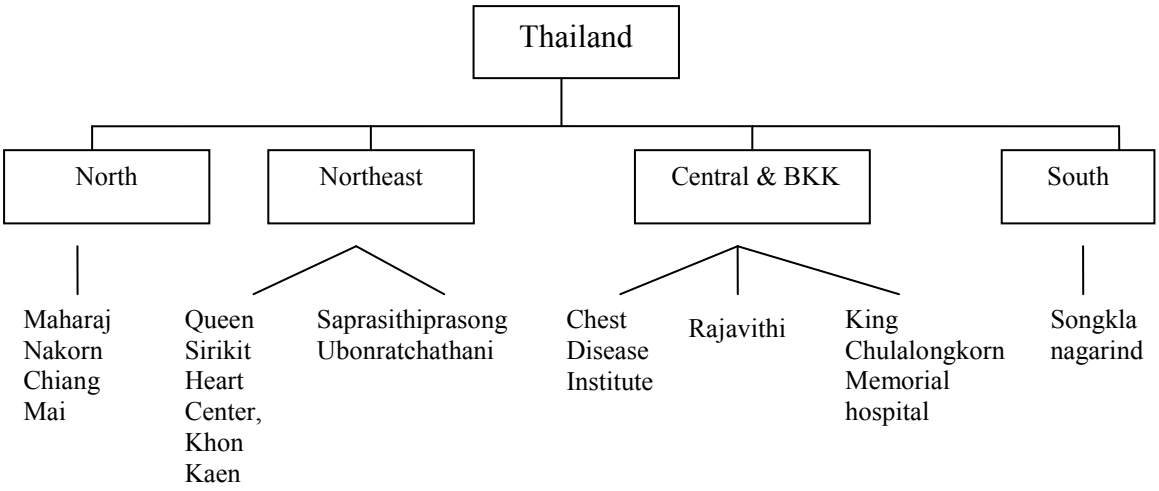

Figure1 Multi-stage sampling

Sample Size

Participants were divided into two groups; pilot study and psychometric properties testing study. Sample size of each group was as follows:

Sample of the pilot testing (Phase I study) Pilot study was conducted to evaluate preliminary internal consistency reliability of the scale, item analysis, and initial factor analysis of the first draft scales. A convenience sample of 150 patients who met inclusion criteria from two hospitals in Bangkok was selected to participate in this study. Sample size was set as a sufficient case to obtain an accurate solution in exploratory factor analysis as long as item inter-correlations are reasonable strong (Hair, Black, Babin, & Anderson, 2010; Hinkin, 1998; Johanson & Brooks, 2010).

Sample of the psychometric properties testing (Phase II study) Sample size for psychometric properties testing was calculated based on factor analysis criteria. Sample size of 50 is suggested as very poor, 100 as poor, 200 as fair, 300 as good,

500 as very good, and 1,000 as excellent for conducting factor analyses (Comrey & Lee, 1992). A convenience sample of 500 was employed in this study.

Scale Development Process

The steps implemented in constructing the RTC-CHBS and readiness rulers parallel the scale development guideline provided by DeVillis (2012) and Hinkin (1998). This study was conducted in two phases (Figure 2). Phase I study involved three steps: 1) defining construct and generating item pool; 2) establishing content validity; and 3) pilot testing. Phase II study sought to confirm the validity and reliability of the refined scales.

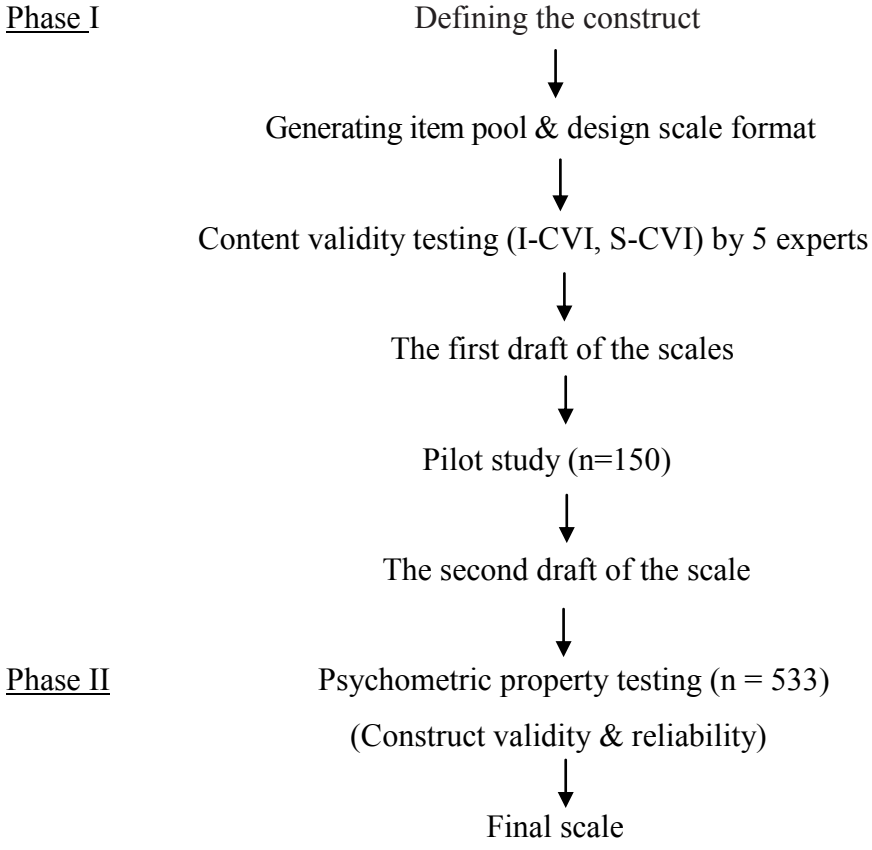

Figure 2 Instrument development procedure

Phase I: Generating Item Pool, Content Validity Evaluation, & Pilot Testing

Generating item pool A comprehensive literature review on cardiac health behaviors of the patients during 3-month recovery period following surgery and the TTM was conducted. The SOC was used to categorize the patients into 5 stages. However, since this study focused on the 3-month recovery period, thus maintenance stage (make change on a new behavior for > 6 months) was omitted (J. O. Prochaska, personal communication, December 5, 2011). The RTC on cardiac health behaviors consists of 4 stages (PC, C, PR, and A).

Two types of scales were developed. The first type was the continuous method which consisted of 5 multi-item questionnaires, and the second type was the readiness rulers for cardiac health behaviors which composed of 5 rulers. These scales development was guided by the TTM, literature review, experts' opinions and input from the pilot participants.

Items were generated to reflect characteristics of the patients in each readiness stage (subscale): precontemplation, contemplation, preparation, and action. Some items were modified from existing instruments (URICA and URICA-E2). However, item contents were modified to make more reflection of the target behaviors in this study, and the language used by the cardiac surgical patients were included. The researcher visited cardiac surgical patients after their hospital discharge. Words or sentences used by the patients were applied to generate scale items. Each item was written in a short declarative statement reflecting the readiness to change of cardiac surgical patients.

Scoring and classification method: Each item was measured by 5- point Likert scale (1= strongly disagree, 2= disagree, 3=unsure, 4= agree, and 5 = strongly agree). To classify individual to a readiness stage, score on items of each subscale (readiness stage) were summed. Each subscale score was divided by the number of its own number of item yielding the average raw score. Then average raw score of each subscale was converted to T-score (mean of 50 and a standard deviation of 10). The participant was assigned to a stage of readiness which shows the highest T-score. In case of more than one highest T-score subscales, the participant was assigned to the more advanced stage of readiness (Forsberg, Ekamn, Halldin, & Ronnberg, 2004; Hodgin, 2001; Levesque, Gelles, & Velicer, 2000; Rollnick et al., 1992).

The first draft of the RTC-CHBS is a set of 5 self-reported RTC questionnaires as follows:

1) The RTC-medication taking questionnaire (RTC-MQ) consists of 28 items: 6 items for precontemplation, 11 for contemplation; 8 for preparation; and 3 for action

2) The RTC-exercise questionnaire (RTC-EQ) consists of 22 items: 5 items for precontemplation, 6 for contemplation; 8 for preparation; and 3 for action

3) The RTC-nutrition taking questionnaire (RTC-NQ) consists of 21 items: 4 items for precontemplation, 7 for contemplation; 7 for preparation; and 3 for action

4) The RTC-complication prevention questionnaire (RTC-CQ) consists of 27 items: 3 items for precontemplation, 10 for contemplation; 10 for preparation; and 4 for action

5) The RTC-symptom management questionnaire (RTC-SQ) consists of 21 items: 4 items for precontemplation, 5 for contemplation; 7 for preparation; and 5 for action

Specification of the first draft RTC questionnaires are presented in Table 4-8

Table 4 Specification for the RTC-MQ and readiness ruler for medication taking

Domain	Measurement	
	RTC –MQ items	**Readiness ruler sentence**
Precontemplation – No intention to take medication consistently after surgery – Unaware or under-aware that not taking medication consistently as prescribed can affect their recovery – No knowledge regarding postoperative medications that must be consistently taken in order to control postoperative complications such as cardiac arrhythmia, infection, or heart failure	med 1 ฉันไม่ได้คิดเรื่องการกินยาหลังผ่าตัด med 23 …….. med 12 ถ้าหลังผ่าตัดจะลืมกินยาบ้าง คงไม่มีปัญหาอะไรมาก med 14 …….. med 13 ถ้าแผลผ่าตัดหายดีก็คือหายแล้ว ไม่ต้องกังวลเรื่องการกินยา med 15 ……..	ฉันไม่ได้คิดเรื่องกินยาหลังผ่าตัด
Contemplation – Thinks about how to take medication consistently but not taking them consistently right now – Knows that after heart surgery they should take medications as prescribed consistently but they unable to overcome obstacles – Has low confidence to get the better ways to be able to take medications consistently	med 8 ฉันอยากกินยาให้ได้ตามที่หมอสั่งทุกมื้อ แต่ไม่รู้ว่าฉันจะทำได้เมื่อไร med 2 ฉันพอจะรู้ว่าช่วงแรกๆหลังผ่าตัดหัวใจ ต้องกินยาให้ตรงตามที่หมอสั่งไปอีก สักพักจนกว่าจะหายดี med 7 …….. med 9 …….. med 10 …….. med 11 …….. med 16 …….. med 17 …….. med 24 บางทีฉันก็ไม่กินยาขับปัสสาวะ เพราะฉันไปห้องน้ำบ่อยๆไม่ไหว med 3 ฉันไม่แน่ใจว่าจะกินยาได้ตามที่หมอสั่งทุกมื้อ med 25 ……..	ฉันคิดว่าจะกินยาตามหมอสั่ง แต่ยังไม่แน่ใจว่าจะทำได้

Table 4 (Continue)

Domain	Measurement	
	RTC- MQ items	**Readiness ruler sentence**
Preparation		
– plan to start taking medication consistently within 30 days	med 5 ฉันจะกินยาตามหมอสั่งอย่างเคร่งครัดให้ได้ ภายใน 1 เดือน ข้างหน้า	ฉันมั่นใจว่าจะกินยาตามหมอสั่งอย่างสม่ำเสมอได้ภายใน 1 เดือน ข้างหน้า
– Seeks knowledge and strategies to be able to take medications consistently as prescribed	med 6 ฉันอ่านเอกสารเกี่ยวกับยาหลังผ่าตัด จะได้กินยาตามหมอสั่งได้ถูก med 18 …….. med 26 …….. med 28 ……...	
– Has demonstrated some actions to help themselves to be able to take medication consistently	med 19 ฉันคิดว่าฉันมีวิธีที่ทำให้ฉันสามารถกินยาตามที่หมอสั่งได้ทุกมื้อ	
– Trying to take medications consistently but occasionally forgets to take some medications or late taking	med 20 ฉันพยายามกินยาหลังผ่าตัดให้ตรงตามที่หมอสั่ง แต่บางทีก็มีลืมบ้าง med 27 ……..	
Action		
– Takes medication consistently as prescribed without missing any dose or making any change for < 3 months	med 4 ฉันกินยาตรงตามที่หมอสั่งอย่างเคร่งครัดมาได้สักพักแล้ว แต่ยังไม่ถึง 3 เดือน	ฉันกินยาตามหมอสั่งอย่างสม่ำเสมอ
– Acknowledges effort to continue taking medications throughout recovery period	med 21 ตอนนี้ฉันกินยาหลังผ่าตัดตรงตามที่หมอสั่งทุกมื้อและจะพยายามให้ได้อย่างนี้ไปตลอด med 22 ……..	

Table 5 Specification for the RTC-EQ and readiness ruler for exercise

Domain	Measurement	
	RTC -EQ item	**Readiness ruler sentence**
Precontemplation – No intention to follow exercise protocol after surgery – Unaware or under-aware that not following exercise protocol can affect their recovery – No knowledge regarding postoperative exercise that help to regain heart function and promote recovery	ex 1 ฉันไม่ได้คิดเรื่องการออกกำลังกายหลังผ่าตัด ex12 ถึงไม่ออกกำลังกายหลังผ่าตัด ฉันก็หายจากโรคหัวใจเหมือนคนอื่น ex14 …….. ex13 จะฟื้นตัวเร็วหรือช้าหลังผ่าตัดไม่เกี่ยวกับการออกกำลังกาย ex15 ……..	ฉันไม่ได้คิดเรื่องออกกำลังกายหลังผ่าตัด
Contemplation – Thinks of following exercise protocol but do not follow the protocol right now – Knows that they should follow exercise protocol after surgery but unable to overcome obstacles – Has low confidence to get the better ways to be able to follow exercise protocol	ex 8 ฉันอยากรอให้แข็งแรงก่อนแล้วค่อยคิดเรื่องการออกกำลังกายหลังผ่าตัด ex 2 …….. ex 3 …….. ex 7 ฉันรู้ว่าควรออกกำลังกายหลังผ่าตัด แต่ฉันไม่ค่อยมีเวลา ex9 …….. ex10 ……..	ฉันคิดว่าจะออกกำลังกายตามคำแนะนำหลังผ่าตัด แต่ยังไม่แน่ใจว่าจะทำได้
Preparation – Plans to follow exercise protocol within 30 days – Seeks knowledge and strategies to be able to follow exercise protocol – Has demonstrated some actions to help themselves to be able to follow exercise protocol – Trying to follow exercise protocol but has never complete all recommendations	ex 5 ฉันจะออกกำลังกายหลังผ่าตัดให้ได้ตรงตามคำแนะนำภายใน 1 เดือน ex 6 ฉันตั้งใจอ่านเอกสารเกี่ยวกับการออกกำลังกายหลังผ่าตัด ex16 …….. ex17 …….. ex18 …….. ex11 ฉันเดินออกกำลังกายถ้ามีเวลา แต่ไม่เคยสนใจว่าเดินได้วันละกี่นาที ex19 …….. ex 20 ……..	ฉันมั่นใจว่าจะออกำลังกายตามคำแนะนำหลังผ่าตัดได้ภายใน 1 เดือนข้างหน้า
Action – Has followed exercise protocol for less than 3 months – Acknowledges effort to follow exercise protocol throughout recovery period	ex 4 ฉันออกกำลังกายหลังผ่าตัดตามที่แนะนำทุกวันมาได้สักพัก แต่ยังไม่ ถึง 3 เดือน ex21 ฉันออกกำลังกายหลังผ่าตัดตามคำแนะนำและจะพยายามทำให้ได้ อย่างนี้ไปตลอด ex22 ……..	ฉันออกกำลังกายตามคำแนะนำหลังผ่าตัดอย่างสม่ำเสมอ

Table 6 Specification for the RTC-NQ and readiness ruler for nutrition taking

Domain	Measurement	
	RTC –NQ items	**Readiness ruler sentence**
Precontemplatiom – No intention to follow nutrition plan after surgery – Unaware or under-aware that not following nutrition plan after surgery can affect their recovery – No knowledge regarding postoperative nutrition taking that help to promote recovery	nu 1 ฉันไม่ได้คิดถึงเรื่องการกินอาหารตามคำแนะนำหลังผ่าตัด nu 5 …….. nu 9 ฉันจะหายเร็วหรือช้าหลังผ่าตัด ไม่น่าเกี่ยวกับอาหารที่ฉันกิน nu13 ……..	ฉันไม่ได้คิดเรื่องกินอาหารตามคำแนะนำหลังผ่าตัด
Contemplation – Thinks of following nutrition plan but do not follow the plan right now – Knows that after surgery they should follow nutrition plan but they unable to overcome obstacles – Has low confidence to get the better ways to be able to follow nutrition plan	nu 7 ฉันไม่มั่นใจว่าจะกินอาหารตามคำแนะนำหลังผ่าตัดได้ nu3 ฉันคิดว่าการกินอาหารตามคำแนะนำหลังผ่าตัดทำให้ฉันหายเร็วขึ้น nu 8 กินอาหารให้ได้ตามคำแนะนำหลังผ่าตัดเป็นสิ่งดี แต่คงเป็นไปไม่ได้ ที่จะทำตามได้ทุกอย่าง nu12 ..... nu15 …… nu18 …… nu 20 ……..	ฉันคิดว่าจะกินอาหารตามคำแนะนำหลังผ่าตัด แต่ยังไม่แน่ใจว่าจะทำได้
Preparation – Plans to follow nutrition plan after surgery within 30 days – Seeks knowledge and strategies to be able to follow nutrition plan – Has demonstrated some actions to help themselves to be able to follow nutrition plan – Trying to follow nutrition plan but sometime deviate from the plan	nu 4 ฉันตั้งใจจะกินอาหารตามคำแนะนำหลังผ่าตัดให้ได้ภายใน 1 เดือน ข้างหน้า nu 10 ฉันตั้งใจฟังเวลาพยาบาลสอนเรื่องการกินอาหารหลังผ่าตัด nu14 …… nu19 …….. nu21 …… nu16 ฉันพยายามกินอาหารตามแบบที่โรงพยาบาลจัดให้หลังผ่าตัด nu17 ……..	ฉันมั่นใจว่าจะกินอาหารตามคำแนะนำหลังผ่าตัดอย่างสม่ำเสมอได้ภายใน 1 เดือนข้างหน้า
Action – Has adhered to nutritional plan every day for less than 3 months. – Acknowledges effort to follow nutrition plan throughout recovery period	nu 6 ฉันกินอาหารตามคำแนะนำหลังผ่าตัดมาสักพักแล้วแต่ยังไม่ถึง 3 เดือน nu 2 ฉันคอยเตือนตัวเองว่าต้องกินอาหารตามคำแนะนำหลังผ่าตัดให้ได้ แบบนี้จนกว่าจะหายดี nu11 ……..	ฉันกินอาหารตามคำแนะนำหลังผ่าตัดอย่างสม่ำเสมอ

Table 7 Specification for the RTC-CQ and readiness ruler for complication prevention

	Measurement	
Domain	**RTC-CQ items**	**Readiness ruler sentence**
Precontemplation – No intention to prevent postoperative complications – Unaware or under-aware that not taking action on prevention complications by themselves can affect recovery – No knowledge related to postoperative complications that usually occur during recovery period and (s)he has to pay attention in prevention of these complications	com 1 ฉันไม่ได้คิดว่าจะต้องคอยสังเกตอาการผิดปกติหลังผ่าตัดของตัวเอง com 5 …….. com 9 ถ้าฉันกลับบ้านได้หลังผ่าตัดแปลว่าฉันปลอดภัยดีแล้ว ไม่น่ามีอาการผิดปกติเกิดขึ้น	ฉันไม่ได้คิดเรื่องการระวังและป้องกันภาวะแทรกซ้อนหลังผ่าตัด
Contemplation – Thinks of prevention postoperative complications by themselves but do not take any action – Knows that after heart surgery they should take action on prevention postoperative complications but they unable to overcome obstacles – Has low confidence to responsible for prevention postoperative complications	com10 ฉันควรระวังเรื่องแผลติดเชื้อและสังเกตการเต้นผิดจังหวะของหัวใจหลังผ่าตัด แต่ตอนนี้ …… com 2 ถึงฉันจะกลับบ้านได้แล้วหลังผ่าตัด ฉันยังต้องดูแลแผลของตัวเอง com 6 …….. com11 ฉันควรดูแลแผลและการทำงานของหัวใจช่วงหลังผ่าตัด แต่ฉันขี้เกียจทำ com 14 …… , com 16 …….. com 18 ……, com 19 …… com22 ……., com24 ……	ฉันคิดว่าจะระวังและป้องกันภาวะแทรกซ้อนหลังผ่าตัดของฉัน แต่ยังไม่แน่ใจว่าจะทำได้
Preparation – Plans to take action on prevention postoperative complications within 30 days – Seeks knowledge and strategies to prevent postoperative complications – Has demonstrated some actions on prevention postoperative complications – Trying to follow recommendations for prevention postoperative complications but inconsistently perform	com 3 ฉันจะฝึกตัวเองให้คอยดูแลแผล วัดไข้ จับชีพจร และชั่งน้ำหนักให้ ได้ทุกวัน ภายใน 1 เดือนข้างหน้า com 7 ฉันตั้งใจฟังเวลาพยาบาลสอนเกี่ยวกับการ ดูแลแผลผ่าตัด com 12 ……., com 15 …… com17 ……, com 20 …… com 21 ฉันหาสมุดมาจดน้ำหนักตัว ชีพจร และไข้ของตัวเองจะได้ไม่ลืม com23 …, com 25 ……., com26 ……	ฉันมั่นใจว่าจะปฏิบัติตามคำแนะนำเพื่อระวังและป้องกันภาวะแทรกซ้อนหลังผ่าตัดได้ภายใน 1 เดือนข้างหน้า
Action – Consistently follows recommendations for prevention postoperative complications for less than 3 months – Acknowledges effort to follow recommendation for prevention postoperative complications throughout recovery period	com 4 ฉันทำตามที่พยาบาลแนะนำเรื่องการดูแลแผลผ่าตัดและ …….. com 8 ฉันชั่งน้ำหนักตัวและจับชีพจรทุกวัน และจะพยายามทำให้ได้อย่างนี้ไปตลอด com 13 …….. com 27 ……..	ฉันปฏิบัติตามคำแนะนำเพื่อระวังและป้องกันภาวะแทรกซ้อนหลังผ่าตัดอย่างสม่ำเสมอ

Table 8 Specification for the RTC-SQ and readiness ruler for symptom management

	Measurement	
Domain	**RTC-SQ items**	**Readiness ruler sentence**
Precontemplation – No intention to manage postoperative symptoms after surgery – Unaware or under-aware that poor symptom management can affect their recovery – No knowledge that pain, constipation, and difficult to sleep are the major symptoms occurring during recovery from heart surgery and symptoms self-management can enhance smooth recovery	sym 1 ฉันไม่ได้คิดว่าหลังผ่าตัดฉันต้องคอยจัดการอาการปวดแผล ท้อง ผูก และนอนไม่หลับ sym 5 ฉันคิดว่าผ่าตัดแล้วโรคหัวใจจะหายขาด เรื่องอาการปวดแผล ท้องผูก และนอนไม่หลับไม่สำคัญ sym 9 …… sym15 ฉันไม่ต้องจัดการอาการปวดแผล ท้องผูก และนอนหลับ ฉันก็ หายดีหลังผ่าตัดได้	ฉันไม่ได้คิดเรื่องการจัดการอาการหลังผ่าตัด
Contemplation – Thinks of symptom self-management but do not start to do right now – Knows that they should take action on symptom management after surgery but they unable to overcome obstacles – Has low confidence to manage postoperative symptoms by him/herself	sym 6 ฉันต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัด แต่ตอนนี้ทำได้บ้างไม่ได้บ้าง sym 2 ฉันต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัด ฉันจะได้หายเร็วขึ้น sym 10 …… sym 16 …… sym 19 ……	ฉันคิดว่าฉันควรจัดการอาการหลังผ่าตัดของฉัน แต่ยังไม่แน่ใจว่าจะทำได้
Preparation – Plans to start symptom self-management within 30 days – Seeks knowledge to use both medicine and non-medicine strategies to manage postoperative symptoms	sym 3 ฉันมั่นใจว่าฉันสามารถจัดการอาการปวดแผล ท้องผูก และ…… sym 7 ฉันตั้งใจฟังเวลาพยาบาลสอนเรื่องอาการปวดแผล ท้องผูก และ…… sym 11 …… sym 12 …… sym 20 ……	ฉันมั่นใจว่าจะปฏิบัติตามคำแนะนำเพื่อจัดการอาการหลังผ่าตัดได้ภายใน 1 เข้างหน้า
– Has demonstrated some actions on symptom self-management – Trying to use both medicine and non-medicine strategies to manage postoperative symptoms but sometimes rely on medication only	sym 17 ฉันกำลังเริ่มลองทำหลายวิธีเพื่อจัดการอาการปวดแผล ท้องผูก นอนไม่หลับ sym 18 ……	
Action – Follow recommendations to use both medicine and non-medicine strategies to manage postoperative symptoms for less than 3 months – Acknowledges effort to use both medicine and non-medicine strategies to manage postoperative symptoms throughout recovery period	sym 4 ฉันทำทุกอย่างตามที่พยาบาลสอนเพื่อจัดการอาการปวดแผล ท้องผูก นอนไม่หลับ แต่ยังไม่ถึง 3 เดือน sym 8 ฉันมีวิธีที่ทำให้ฉัน …… sym 13 …… sym 14 …… sym 21 ……	ฉันปฏิบัติตามคำแนะนำเพื่อจัดการอาการหลังผ่าตัดอย่างสม่ำเสมอ

Five readiness rulers were developed in corresponding to 5 target behaviors in this study. Scale format of the ruler was modified from the readiness ruler for alcohol consumption behavior (LaBrie et al., 2005). Labrie's readiness ruler is a 0-10 rating ruler with statements for helping the patient assesses their own level of readiness to change.

In this study, the statements were modified to reflect the 4 stages of readiness. Patients will be asked to rate their degree of readiness for each behavior ranging from 0 – 7 score. There also have statements for helping the patients assess their own level of readiness. The questions for each ruler are as follows:

1) How ready you are for medication taking during 3-month recovery period?
2) How ready you are for exercise during 3-month recovery period?
3) How ready you are for nutrition taking during 3-month recovery period?
4) How ready you are for complications prevention during 3-month recovery period?
5) How ready you are for symptom management during 3-month recovery period?

Criteria for classify the patient into readiness stage are as follows: score 0-1 represent Precontemplation; score 2-3 represent Contemplation; score 4-5 represent Preparation; and score 6-7 represent Action stage.

Content validity evaluation Content validity was assessed using a panel of 5 experts. The first one is an American professor and nurse practitioner who expert in TTM and use TTM as a framework in everyday practice. The second expert is a Thai advanced practice nurses who have more than 10-year experiences in cardiac surgical

nursing. Two experts are nurse professors who expert in TTM, and in cardiac surgical nursing. The fifth expert is a Thai cardiac surgeon. Because the scales developed in this study are in Thai language, content validity index was assessed by four Thai experts. An American expert evaluated content validity qualitatively and discussed with the researcher for the refinement of the scale. Content validity was assessed quantitatively by computing content validity index (CVI) for both item level and scale level. For item-level CVI (I-CVI), a panel of experts were asked to rate each scale item in terms of its representativeness, clarity, and comprehensiveness. Representativeness was assessed using 4-point: 1 = not representative, 2 = needs major revision, 3 = needs minor revision, 4 = representative (Lynn, 1986 cited in Polit & Beck, 2006; Davis, 1992). Written comments were requested responses with a rating of 2 or lower. The I-CVI was computed as the number of experts giving the rating of 3 or 4, divided by the total number of experts. A good content validity was indicated by I-CVI ≥ .80. Items with I-CVI less than .80 were considered for exclusion or revision (Waltz et al., 2010). Scale-level CVI (S-CVI) in this study means the average proportion of items rated as 3 or 4 across the various judge of experts. Average S-CVI was calculated by summing of I-CVI and dividing by the number of items. The first draft scales were emerged after content validity testing. Detail of the first draft of the scales was provided in Appendix A.

Pilot study Aims of the pilot study were (1) to determine reliability and validity of the RTC questionnaires and readiness rulers, and (2) to modify the first draft of the RTC questionnaires and readiness rulers. The second draft of the scales is a result of the pilot study.

The pilot study was conducted in two hospitals in Bangkok, Thailand from March through June of 2012. Data were collected from 150 cardiac surgical patients by the primary researcher and research assistants. The profile of the pilot participants included that they were, in the majority, male (59%), fewer than 60 years old (66%), and within 30 days after operation (53%). Most of the participants (74%) had elementary or high school education level.

A package of questionnaire including demographic data form, 5 RTC questionnaires, and 5 readiness rulers was administered to the participants. It required approximately 50 to 60 minutes to completing all questionnaires in a package. Ten out of 150 participants required further explanations about the questions. Specifically, opinions regarding readability, difficulty, and relevancy for cardiac surgery patient's conditions were obtained from these ten pilot participants. Suggestions from these participants were used to refine the instruments in combined with the findings of data analysis. Each participant was asked to wait for 30 minutes after the completion of the first questionnaire package. Five readiness rulers were then distributed to the same participants to obtain test-retest reliability. All questionnaires were checked, if there were any missing data, the participants were asked for complete them.

Findings from both validity and reliability analyses and participants' feedback were utilized to modify the RTC questionnaires and readiness rulers. Production of phase I study yield the second draft scales.

Modifications of the Instruments

Modifications of the first draft of five RTC questionnaires and readiness rulers were performed based on the results of item analysis, exploratory factor analysis, as well as feedback from the participants in the pilot study.

1. Modification of the RTC questionnaires. Item analysis of each subscale was conducted using the following criterion: (1) items with corrected item-total correlations less than 0.30 (Ferketich, 1991; Nunnally & Bernstein, 1994) were reconsidered for the relevance; (2) items that were highly correlated with other subscale items (r >.70) were re-examined for deletion due to redundancy; and (3) A Cronbach's alpha of .70 is considered acceptable for a newly developed scale. If item deletion will increase subscale alpha, such item is considered to be deleted. As individual items were deleted, Cronbach's alpha was recomputed for the remaining items, and the new corrected item-total correlations were evaluated for further deletion of items.

Principle component analysis (PCA) with Varimax rotation was used to explore preliminary factor structure of the first draft scales, and to further reduce item numbers. Prior to performing PCA, the Kaiser-Meyer-Olkin (KMO), a test for sampling adequacy, and Barrete's test of sphericity, a test of the suitability of the correlation matrix for exploratory factor analysis were assessed. Four criteria were used to select the number of factor rotated: Eigen value greater than 1, the scree plot, percentage of total variance explained, and importantly theoretical consideration (Hair et al., 2010). Varimax rotation produces factors that have high loading on some items and low loading on other items, which facilitate identification of each factor. Identification of subscales was based on the factor loading ≥ .40 (Hair et al., 2010). Items loaded equally highly into more than one factor were deleted to achieve more meaning solution. Findings of exploratory factor analysis were used to confirm the decision to delete the questionable items if they loaded on more than one factor.

Decision on item retained, deleted, or revised was performed not only based on these criterion but also the fit between item and its construct. If items were subjected to be deleted based on item analysis and EFA but deletion of these items affect construct attributes, they will be revised instead. The analyses and refinements of each RTC questionnaire were as follows:

1.1 The RTC-MQ The original RTC-MQ consisted of 28 items. Results of item analysis showed 8 items with item-total correlations less than .3. Eight items, then, were deleted from the scale. Seven items were eliminated to reduce number of item based on the above criteria. One item, "I sometimes did not take diuretic drugs because I cannot stand going to the toilet often", was deleted because some participants had no diuretic drugs and they informed that they cannot answer this item. One item was reworded. "Within the next 30 days, *I will take medication* prescribed by the doctor consistently" had low item-total correlation (.29); however, it represented an important construct definition of preparation, which is an intention to take action at a specific time that usually measured within 1 month. This item was reworded to reflect more intention of the patients. It was reworded to "*I strongly intend* to take medications consistently as prescribed within the next 1 month". As a result, the RTC-MQ consists of 12 items (precontemplation=3, contemplation=4, preparation=3, and action=2).

1.2 The RTC-EQ From 22 scale items, eight items were deleted to increase subscale reliability and one item was deleted due to the item-total greater than .7 which indicated redundancy based on the given criteria. One item was reworded from "Within the next 30 days, *I will exercise* after surgery as suggested" to "*I strongly intend* to exercise consistently as recommended within the next 1 month".

The modified RTC-EQ is comprised of 13 items ((precontemplation=2, contemplation=4, preparation=5, and action=2).

1.3 The RTC-NQ Item analysis on the 21-item RTC-NQ was conducted. Eight items were deleted based on the criteria given earlier. One item, "*I intend to follow the postoperative nutrition plan* within the next 30 days" had a low item-total correlation as .11. This item was reworded to "*I strongly intend to eat nutritious food, and reduce sweet, salty, and high-fat food* within the next 1 month" to make it more understandable. As a result, the modified RTC-NQ is comprised of 13 items (precontemplation=2, contemplation=4, preparation=5, and action=2).

1.4 The RTC-CQ. The first draft of the RTC-MQ consisted of 27 items. Six items were deleted due to low item-total correlations. Eight items were deleted due to redundancy and to reduce number of scale item. One item, "I keep reminding myself not to sit with legs down because if my legs get swollen, the surgical wound will not heal and be painful" was deleted because of it suitable for the patients with CABG surgery only. One item was reworded. "Within the next 30 days, *I will train myself* to take care of the surgical wound and to check body temperature, pulse, and weight every day" was reworded to "*I strongly intend* to take care of the surgical wound and to check body temperature, pulse, and weight every day within the next 1 month". As a result, the RTC-CQ consists of 12 items (precontemplation=2, contemplation=4, preparation=4, and action=2).

1.5 The RTC-SQ Item analysis on the 21-item RTC-NQ was conducted. Seven items were deleted to increase subscale reliability based on the setting criteria. One item, "Within the next 30 days, *I will be able to* manage incision

pain, constipation, and insomnia well" had low inter-item correlation. This item was reworded to "*I strongly intend* to manage incision pain, constipation, and insomnia *by myself* within the next 1 month". As a result, the modified RTC-SQ is comprised of 14 items (precontemplation=3, contemplation=3, preparation=4, and action=4).

In sum, the original RTC questionnaires were modified. One of the preparation's items of all questionnaires was reworded in a same manner as described. Number of item for each scale were reduced to 12 items for RTC-MQ, 13 items for RTC-EQ, 13 items for RTC-NQ, 12 items for RTC-CQ, and 14 items for RTC-SQ.

2. Modification of the readiness rulers. Thirty-minute interval test-retest reliability was evaluated in 150 participants. Percentage agreement reflects the extent to which the participants classified into the same stage between two times tests was utilized. The results showed acceptable reliability of the readiness rulers. Percentage agreement was 82.7% for RTC-MQ, 73.3% for RTC-EQ and RTC-NQ, 74% for RTC-CQ, and 82.7% for RTC-SQ.

Initial convergent validity of the rulers was evaluated by the agreement between readiness stage as allocated by each pair of RTC questionnaire and responses on the readiness rulers. Percentage of agreement was ranged from 26 to 36 %, which represent poor classification agreement.

Due to low convergent validity, the readiness rulers were reexamined. Suggestions from the participants were taken into account for the revision of the readiness rulers. Some participants reported that it was difficult to make a decision on 0-7 rating ruler with four sentences under the rulers. It might be easier for them if there was 4 rating scale with four sentences. This finding is consistent with the

previous study (Heather et al., 2008). The rulers with some anchor statements that were not perfectly in line with the numbers on the ruler cause ambiguity and may influence the responses to the ruler. Heather et al., therefore, adapted the ruler into a 5-point Likert scale in which anchor statement describing different stages of change were perfectly aligned with numbers. In addition, most of pilot participants had elementary or high school education level (74.0%). It's possible that they were confused by the format of the readiness ruler. Decision was made to modify the format of the readiness rulers into a 4-point rating scale in which anchor statement describing four different readiness stages (PC, C, PR, and A) were perfectly aligned with numbers (Appendix B). For the second draft readiness ruler, participants will be asked to rate their degree of readiness for each behavior ranging from 0 – 3 score. Scoring method for the ruler is as follow:

0 – 0.5 = Precontemplation
0.6 – 1.5 = Contemplation
1.6 – 2.5 = Preparation
2.6 – 3.0 = Action

Phase II: Psychometric Property Testing

In phase II study, psychometric properties testing of the second draft scales were analyzed using a new dataset obtained from another 533 participants. The 5 RTC questionnaires were tested for construct validity, convergent validity, internal consistency reliability. The 5 readiness rulers were tested for test-retest reliability and convergent validity.

Research Measures

Research measures that were used in phase II study consisted of demographic data form, second draft RTC questionnaires and readiness rulers.

1. Demographic data form

The Demographic data form was developed to collect information of participants regarding age, gender, education level, type of operation, duration after surgery, and co-morbidity (Appendix D)

2. The second draft of readiness to change for cardiac health behaviors scale (RTC-CHBS)

The second draft RTC-CHBS consists of five separate, self-report questionnaires for measuring RTC on five target behaviors: medication taking (RTC-MQ); exercise (RTC-EQ; nutrition taking (RTC-NQ); complication prevention (RTC-CQ); and symptom management (RTC-SQ). Number of scale item is as follows:

1. RTC- MQ 12 items (PC = 3, C = 4, PR = 3, A = 2)
2. RTC-EQ 13 items (PC = 2, C = 4, PR = 5, A = 2)
3. RTC-NQ 13 items (PC = 2, C = 5, PR = 4, A = 2)
4. RTC-CQ 12 items (PC = 2, C = 4, PR = 4, A = 2)
5. RTC-SQ 14 items (PC = 3, C = 3, PR = 4, A = 4)

3. The second draft readiness rulers

The second draft readiness rulers were a 0-3 rating scale rulers as described in the modification of readiness rulers part. There are five readiness rulers for measuring RTC on five target behaviors: medication taking (RR-medication); exercise (RR-

exercise); nutrition taking (RR-nutrition); complication prevention (RR-complication prevention); and symptom management (RR-symptom management).

Research Assistant training

Because of a large sample size and a multi-center study, the researcher utilized fourteen research assistants for this study. Data collection was conducted in seven hospitals from four different geographical area of Thailand. Two research assistants per hospital were recruited. Research assistants were thirteen master degree nurses who have experience in research study and one baccalaureate prepared nurse interested in the research. Before data collection, study protocols were sent to research assistants to allow them to have enough time to read. One week later, the researcher discussed with research assistants from each hospital for approximately 30-45 minutes. Description of the study, data collection procedure, and the protection of human subject were discussed (direct contact discussion were performed in 5 hospitals and phone contact in 2 hospitals). The completeness and accuracy of the data were emphasized. Unclear or misunderstanding for all topics were assured.

In an early phase of data collection, close supervision by the primary researcher was employed by telephone contact to ensure compliance with procedures and to allow for individual feedback on performance and quality of data collection. The primary researcher monitored the completeness and accuracy of the data regularly by weekly phone call during data collection process. Problematic issue in each setting was discussed periodically.

Data Collection Procedure

Data were collected from Thai cardiac surgical patients in outpatient setting and cardiac surgical units. Review and approval of the study were performed by the Institution Review Boards (IRB) of the target hospitals.

Phase II study was undertaken from July through November 2012. Five hundred and thirty three participants from seven hospitals were involved. After the explanation of the study, packages of questionnaire containing demographic data form, second draft of five RTC questionnaires, and five readiness rulers were distributed to the participants. Number of item in the second draft scales was less than the first draft, and the time to complete all questionnaires was 45 minutes. For one RTC questionnaire, it took 5-7 minutes, and 1-2 minutes for each readiness ruler. The 30-minute interval test-retest procedure was used to evaluate the stability of the readiness rulers. During the retest of the ruler, the order of the rulers was randomized to reduce recognition by the participants. Completeness of the responses was then checked. All questionnaires were sent to the primary researcher for data analysis.

Data Cleaning and Management of Missing Data

In the present study, data entry was conducted mostly by the primary researcher except for two data collection sites. Research assistants from two hospitals conducted their own data entries. In this case, the research assistants are familiar with SPSS program. The SPSS file with variable code as well as coding manual was set by the primary researcher and it was sent to these research assistants. Discussion was

made to assure the accuracy of the data entry. The questionnaires from these two hospitals were sent to the primary researcher after the data collection done.

Examining the raw data prior to data entry was made. This process was conducted periodically during data collection process. The 10% random check was utilized in this study to assure an accuracy of data entry phase (Pryjmmachuk & Richards, 2007).

In this study, data from 558 cases were collected. One case was excluded because of the tendency to unreliable response (response 4 in all questions on 5-point Likert scale). Cases with major missing or error data such as the missing of one entire RTC questionnaire or the missing of re-test readiness rulers were discarded. These error data were eliminated because they were considered as data from low reliable data collection procedure. Twenty four cases were eliminated by this reason. In fact, these cases can be used for data analysis because each questionnaire was separately analyzed and interpreted. However, these 24 cases were excluded to prevent confusion of the researcher during data analysis process. More importantly, number of the remaining cases (533 cases) is enough for factor analysis. Among 533 cases, the extent of missing data was assessed using descriptive statistic.

The findings revealed that variable 'RR-medication at T1", item 2 and item 8 of RTC-CQ had missing data 0.2, 0.4, and 0.2 percent, respectively. There were four cases with one missing data (0.75%). Based on the rules of thumb provided by Hair et al.(2010), any of the imputation methods can be applied when missing data are under 10%. In this study, missing data was very low. Thus, mean substitution was used

because of relatively low missing data (less than 1%), easily implementation, and all cases with complete information were provided for data analysis.

Data Analysis

Data were analyzed using SPSS® 16.0 (SPSS® Inc., Chicago, IL, USA) and LISREL 9.1 student version (Scientific Software International, Inc.). Descriptive statistics were used for demographic characteristics of study sample. An alpha level of .05 was set for all statistical tests.

Construct validity was assessed by confirmatory factor analysis (CFA). Data obtained from 533 participants in phase II study were used to conduct a CFA using LISREL 9.1 student version. Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), and χ^2/df ratio were used to evaluate the goodness of fit of the model to the data. Factor loadings and reliability coefficients were used to evaluate validity of the factor construct (Hair et al., 2010).

Convergent validity is achieved when the correlations between measures of similar constructs using different methods (monotrait-heteromethod) are significantly difference from zero and significantly large (Campbell & Fiske, 1959). This study, convergent validity was established to determine the extent to which the RTC questionnaires assess the same construct as readiness rulers. Cramer's V coefficients and percentage of agreements were calculated to compare stage classification using RTC questionnaires and readiness rulers.

Internal consistency reliability of the RTC questionnaires' subscales were represented by Cronbach's alpha coefficients. For a new scale, a Cronbach's α of .70 is considered acceptable (Nunnally & Bernstein, 1994).

The test-rest reliability of the readiness rulers were examined by analyzing the degree to which the rulers classifies patients into the same readiness stage between two time points using the percentage of observed agreement and kappa coefficients. The interpretation of kappa coefficient are < 0 = less than chance agreement, 0.01–0.20 = slight agreement, 0.21– 0.40 = fair agreement, 0.41–0.60 = moderate agreement, 0.61–0.80 = substantial agreement, and 0.81–0.99 almost perfect agreement (Landis & Koch, 1977).

Protection of Human Subjects

Review and approval of the Institutional Review Boards (IRB) of all sample hospitals were obtained. All details in the participant information sheet and inform consent forms were provided to the participants. A unique identification number were assigned to each participant by research assistants during the data collection process to protect confidentiality and anonymity of the participants. An assurance was given that dissemination of results of the study will be done in aggregate form with no identifying information.

CHAPTER IV
RESULTS

This chapter was divided into three major parts: demographic characteristics of the participants, results of analysis related to reliability and validity of the RTC questionnaires and readiness rulers.

Demographic Characteristics of the Participants

A total 533 participants were involved in this study. The sample was composed of 306 (57.4%) males and 227 (42.6%) females. Age ranged from 18 to 86 years, with a mean age of 53.47 years, SD=15.50 years. Most of them (80.9%) had elementary or high school level education, and within the first 2-week recovery period (72.8%). Demographic characteristics of the sample are presented in Table 9.

Table 9 Demographic characteristics of participants in phase II study (n = 533)

Characteristics	Frequency	Percentage
Age (Range 18-86 years; mean 53.47 , SD 15.50)		
18 – 39 years	109	20.45
40 – 59 years	211	39.59
≥ 60 years	213	39.96
Gender		
Male	306	57.41
Female	227	42.59
Education		
Elementary school	302	56.66
High school	129	24.20
Diploma degree	32	6.00
Bachelor degree	57	10.69
Master	9	1.69
Doctoral	4	0.75

Table 9 (continue)

Characteristics	Frequency	Percentage
Type of operation		
Single valve replacement	181	33.96
Coronary Artery Bypass Graft surgery (CABG)	157	29.46
Double valve replacement	54	10.13
Heart valve repair	52	9.76
Closure septum defect	33	6.19
CABG with valve replacement	29	5.44
Heart valve replacement with closure septum defect	7	1.31
CABG with closure septum defect	3	0.56
Other	17	3.19
Days after surgery (Range 1-90; Mean 15.56, SD 18.92)		
1 – 14 days	388	72.80
15 – 30 days	72	13.51
31 – 60 days	42	7.88
61 – 90 days	31	5.82
Comorbidity		
Hypertension	133	24.95
Diabetes	101	18.95
Dyslipidemia	72	13.51
Smoking	43	8.07
Renal disease	18	3.38
Gout	15	2.81
Other	13	2.44
Number of comorbidity		
None	318	59.2
1 comorbidity	102	19.1
2 comorbidities	72	13.5
3 comorbidities	32	6.0
4 comorbidities	6	1.1
5 comorbidities	2	0.4
6 comorbidities	1	0.2

Reliability of the RTC Questionnaires and Readiness Rulers

Reliability of the RTC questionnaires was examined using internal consistency coefficients, the extent to which items of the scale are measuring the same construct. Cronbach's alpha coefficients were employed to determine if there was evidence that items within each subscale were internally consistent. Reliability of the readiness rulers was assessed using test-retest reliability coefficients, the extent to which the same results are obtained on repeated administration of the scales.

Internal Consistency of the RTC Questionnaires

There are five RTC questionnaires developed and tested in this study. Findings on each questionnaire are presented separately. Detail of means, standard deviations, correlation matrix, item-total correlations, and alpha reliability of RTC questionnaires were presented in Appendix E.

The 12-item RTC medication taking questionnaire (RTC-MQ) was analyzed for their means, standard deviations, correlation matrix, item-total correlations, and alpha reliability coefficients**.** Alpha reliabilities on precontemplation (PC), contemplation (C), preparation (PR), and action (A) subscale were .67, .65, .51, and .70, respectively. These results show that internal consistency is slightly lower than acceptable value for the newly developed scale which usually set at .70 (Nunnally & Bernstein, 1994). There were two items (med7 & med 8) which had low corrected item-total correlation (.25 and .21, respectively). Reliabilities of C and PR subscales will increase to .69 and .67 if these items are deleted. Thus, these items were deleted. The final RTC-MQ consists of 10 items. Subscale's alpha reliability was increased to

.67, .69, .67, and .70, which is closed to acceptable reliability. These findings indicate acceptable internal consistency reliability of the RTC-MQ.

The results showed that the 13-item RTC exercise questionnaire (RTC-EQ) had acceptable internal consistency on PC, C, PR, and A subscales, which were .81, .75, .72, and .86, respectively. All subscale's reliability of the RTC-EQ were above .70 and two subscales were above .80. These finding are evidence to support a satisfied internal consistency reliability of the RTC-EQ.

Cronbach's alpha reliability of the 13-item RTC nutrition taking questionnaire (RTC-NQ) was conducted. Alpha reliabilities showed acceptable internal consistency of PC, C, PR, and A subscale, which were .76, .70, .65, and .84, respectively. All subscale's reliability were greater than .70, except PR subscale which was slightly lower than acceptable value. The 12-item RTC complication prevention questionnaire (RTC-CQ) was analyzed. The findings revealed acceptable internal consistency of PC, C, PR, and A subscale, which were .67, .71, .71, and .76, respectively. The findings showed acceptable internal consistency reliability on PC, C, PR, and A subscale of the 14-item RTC symptom management questionnaire (RTC-SQ), which were .70, .71, .73, and .68, respectively.

Table 10 Internal Consistency Reliability of Five RTC Questionnaires (n=533)

RTC questionnaire	Subscale's alpha reliability			
	Precontemplation	Contemplation	Preparation	Action
RTC-MQ [a]	.67	.69	.67	.70
RTC-EQ	.81	.75	.72	.86
RTC-NQ	.76	.70	.65	.84
RTC-CQ	.67	.71	.71	.76
RTC-SQ	.70	.71	.73	.68

[a] Reliability of RTC-MQ was analyzed after two items were deleted.

Test-retest Reliability of the Readiness Rulers

Thirty-minute interval test-retest reliability was evaluated for the readiness rulers to determine the extent to which the two sets of scores are correlated. The readiness rulers aim to classify participant into the particular stage of readiness. The percentage of agreement which is used to determine the absolute agreement between the two sets of scores should be calculated for the test-retest reliability of this kind of instrument (Waltz et al., 2010). The percentage of agreement and kappa coefficients of five readiness rulers are presented in Table 11. Classification agreements are ranged from 77.5 to 88.0% and kappa coefficient greater than .60. Kappa coefficient of the RR-symptom management cannot be calculated due to none of the participant rated him/herself in precontemplation stage at time 2 administer. The results indicated substantial stability of the readiness rulers regarding the performance of the rulers to allocate Thai cardiac surgical patients into the same stage for 30 minutes time frame.

Table 11 Test-Retest Reliability of the Readiness Rulers (n=533)

The readiness ruler	Percentage of agreement	Kappa coefficient
1. RR-medication taking	88.0	.68*
2. RR-exercise	77.5	.65*
3. RR-nutrition taking	81.8	.70*
4. RR-complication prevention	81.1	.67*
5. RR-symptom management	82.7	N/A

Note. N/A = kappa coefficient cannot be calculated.
* $P<.05$

Validity of the RTC Questionnaires and the Readiness Rulers

Content and construct validity of RTC questionnaires and readiness rulers were studied. The content validity was established by content validity index. The construct validity of the RTC questionnaires was established by confirmatory factor analysis. The construct validity of readiness rulers were established by convergent validity.

Content validity

Content validity refers to the extent to which the content of the measure represents the content domain (Waltz et al., 2010). Content validity of the RTC questionnaires and readiness rulers were examined by item content validity index (I-CVI) and scale content validity index (S-CVI). For each item, the I-CVI was computed as number of experts giving the rating of either 3 (quite relevant) or 4 (high relevant) divided by total number of experts (Polit & Beck, 2006). Few items of RTC questionnaires got I-CVI of .75. I-CVI of each item was used to guide in revision of the item content based on experts' opinion. No major change was recommended by the content experts. Only three items of the RTC-MQ, one item of the RTC-EQ, and one item of the RTC-CQ were suggested to be reworded, without changing the meaning, to increase understandability of the patients. The finding on I-CVI was used for the selection and revision of the first draft RTC questionnaire and readiness rulers. The minor changes suggested by the experts also reveal that item content of the RTC questionnaire and the readiness rulers were relevance to the construct content.

The CVI for the entire scale was reported as S-CVI/Ave, the average of the I-CVIs for all items on the scale. The S-CVI/Ave of each RTC questionnaire was

calculated by summing all I-CVIs and divided by the number of items. Using S-CVI/Ave to reflect the CVI for entire scale is more preferable because this put the focus on average item quality rather than only rely on average performance by the experts (Polit & Beck, 2006). The standard criterion of S-CVI/Ave is that it should be .90 or more (Waltz et al., 2010). Table 12 reveals that CVIs of the RTC questionnaires were acceptable, .96 for the RTC-MQ, .99 for the RTC-EQ, 1.00 for the RTC-NQ, .99 for the RTC-CQ, and 1.00 for the RTC-SQ. All readiness rulers were acceptable for their CVIs which are 1.00.

Table 12 Content Validity Index of the RTC Questionnaires and the Readiness Rulers

Scale	S-CVI/Ave
RTC questionnaires	
RTC-MQ	.96
RTC-EQ	.99
RTC-NQ	1.00
RTC-CQ	.99
RTC-SQ	1.00
Readiness Rulers	
RR-medication taking	1.00
RR-exercise	1.00
RR-nutrition taking	1.00
RR-complication prevention	1.00
RR-symptom management	1.00

Construct validity

Two types of analysis were utilized to established construct validity. The construct validity of the RTC questionnaires was established by confirmatory factor analysis (CFA). The construct validity of readiness rulers were established by convergent validity. Results of CFA of each RTC questionnaire are reported separately.

1. Confirmatory factor analysis

Factor analysis is an internal-structure analysis, which is necessary in order to determine whether there is a correspondent between the structure of a set of indicators and the construct they are said to be reflect. The RTC questionnaire items were generated correspondent to four stages of readiness: precontemplation (PC); contemplation (C); preparation (PR); and action (A). CFA with full information maximum likelihood (FIML) was utilized to examine parameter estimations and to test of hypotheses regarding the number of factors underlying the relations among a set of items.

1.1 Confirmatory factor analysis results for the RTC-MQ. The 10-item RTC-MQ was tested for its factor structure validity among Thai cardiac surgical patients. Figure 3 shows the 4-factor model of the RTC-MQ, with path emanating from each factor to identify the item which loaded on each factor. For each path, the factor loadings (which represent the relationship between the item and its factor) are given. The figure also contains estimates of the relationships between factors (indicated by two-headed arrow curved line).

Consistent with the underlying theoretical model, factors in the model were permitted to correlate. To assess the fit of the four-factor structure to the data, multiple fit indices were examined (Hair et al., 2010; Joreskog & Sorbom, 2002). The following goodness-of-fit indices were used to assess the model and the data: chi-square, Goodness of Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Adjusted Goodness of Fit (AGFI).

Chi-square (χ^2) is fundament al measure of differences between the observed and estimated covariance matrices. Ideally a non-significant chi-square is desired. However, it is very difficult to achieve a non-significant chi-square value when sample sizes larger than >250 (Tabachnick & Fidell, 2007). Because of the large sample examined in the present study, the χ^2/df ratio less than three which suggest a good fit model was applied (Hair et al., 2010). The GFI is an absolute fit index which is a direct measure of how the model fit the data and less sensitive to sample size. It was suggested that the value of GFI >.90 indicate a good fit model (Hair et al., 2010). RMSEA is one type of absolute fit index which represent how well the model fit to the population, not just a sample used for estimation. Lower RMSEA values indicate a better fit. A value of RMSEA <.08 is acceptable, and <.05 is excellent (Brown & Cudeck, 1995). The CFI is an incremental fit index that assesses how well the estimate model fit relative to some alternative baseline model. The CFI value of >.90 is acceptable, and >.95 is excellent. The AGFI is a parsimonious fit index. The GFI is adjusted by a ratio of the degrees of freedom used in a model to the total degrees of freedom available. A GFI values >.80 indicate a good fit model. In addition to the interpretation of the goodness-of-fit indices,

modification indices were used to guide the addition of paths between error terms to enhance the fit of the model to the data.

The results of CFA indicated that the unadjusted model of the RTC-MQ was inadequate fit to the data (χ^2 = 114.13, df = 29, p = .000; χ^2/df ratio = 3.9; CFI=.96; GFI = 0.96; AGFI=.92; and RMSEA = 0.07). The CFI, GFI, AGFI, and RMSEA demonstrated an acceptable fit of the model. However, the χ^2/df ratio was greater than three which indicated inadequate model. A review of the modification indices was conducted to assess the possibility of improving the model's fit. Two Covariance paths between measurement error terms among items within contemplation factor were added. A respecified model indicated a good fit to the data (χ^2 = 74.39, df = 27, p = .000; χ^2/df ratio = 2.75; CFI = .98; GFI = 0.97; AGFI=.94; RMSEA = 0.06).

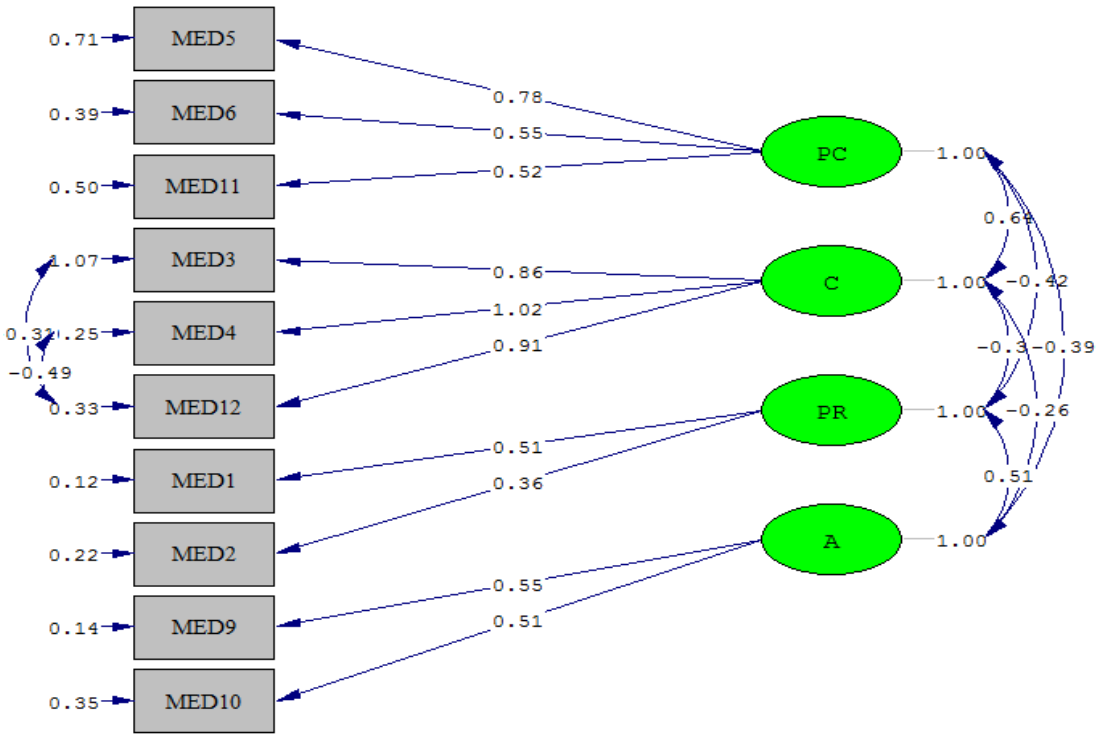

Figure 3 Four-factor correlated model of the RTC-MQ

Factor loading is one indicator of construct validity. Factor loading >.5 confirm that the indicators are strongly related to their associated constructs. Low loadings suggest that a variable is a candidate for deletion from the model (Hair et al., 2010). Table 13 provides parameter estimates (standardized and unstandardized), standard error, item reliability, factor score, and construct reliability of measurement model. All parameter estimates are considered large because the ratios formed by unstandardized parameter estimates to their standard errors are greater than two (Kline, 2011). Standardized factors loading were greater than .5, showing that they are satisfactory indicator for their construct. The RTC-MQ measurement model, as set by the CFA, has therefore been validated.

Table 13 Factor Loading, Factor Score, and Construct Reliability of the RTC-MQ (n=533)

Factor	Standardized factor loading	Unstandardized factor loading	SE	t-value	R^2	Factor score	Construct reliability
Precontemplaton							.68
Med5	0.68	0.78	0.05	15.16	.46	0.26	
Med6	0.66	0.56	0.04	14.82	.44	0.34	
Med11	0.59	0.52	0.04	12.97	.35	0.25	
Contemplation							.84
Med3	0.64	0.86	0.07	13.25	.41	0.06	
Med4	0.90	1.02	0.06	17.04	.81	0.60	
Med12	0.85	0.91	0.09	10.13	.71	0.57	
Preparation							.68
Med1	0.82	0.51	0.04	14.04	.68	1.02	
Med2	0.61	0.36	0.03	11.60	.37	0.40	
Action							.71
Med9	0.82	0.55	0.04	14.31	.68	0.92	
Med10	0.66	0.51	0.04	12.42	.43	0.35	

Square multiple correlation (R^2) or item reliability represents the extent to which a measure's variable is explained by a latent factor. It represents how well an item measures a construct. Item reliability exceeds .3 for all of the items. Construct reliability, a measure of reliability and internal consistency based on the squared of the total of factor loadings for a construct. Construct reliability is computed from the squared sum of factor loadings for each construct and the sum of the error variance for a construct. The formula for construct reliability is:

$$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}$$

L_i is standardized factor loading; e_i is error variance for each construct.

The accepted value for construct reliability should be at least .70 (Hair et al., 2010). Through the formula, it was found that all subscale reach acceptable value. Although it was .68 for precontemplation and preparation subscales, the value was closed to .70. Hence the CFA shows that the RTC-MQ model fit the data and fulfilled the requirement for construct validity.

Table 14 shows correlations among factors. Precontemplation (PC) scores were negatively related to the other factors are expected. However, it was found that PC scores were positively associated with contemplation factor scores with medium size correlation (.64) which is different from previous study. This finding point out that, using RTC-MQ, Thai cardiac surgical participants who were in preconemplation stage have similar characteristic as those in contemplation stage to some extent.

Table 14 Correlations between factors of the RTC-MQ

	PC	C	PR	A
PC	1.00			
C	.64*	1.00		
PR	-.42*	-.31*	1.00	
A	-.39*	-.26*	.51*	1.00

* p <.05

1.2 Confirmatory factor analysis results for the RTC-EQ. The model of the 13-item RTC-EQ is displayed in Figure 4. The goodness of fit indices of the specified model indicate good fit to the data (χ^2 = 155.31, df = 59, p = .000; χ^2/df ratio = 2.63; CFI=.97; GFI = 0.96; AGFI=.93; RMSEA = 0.05).

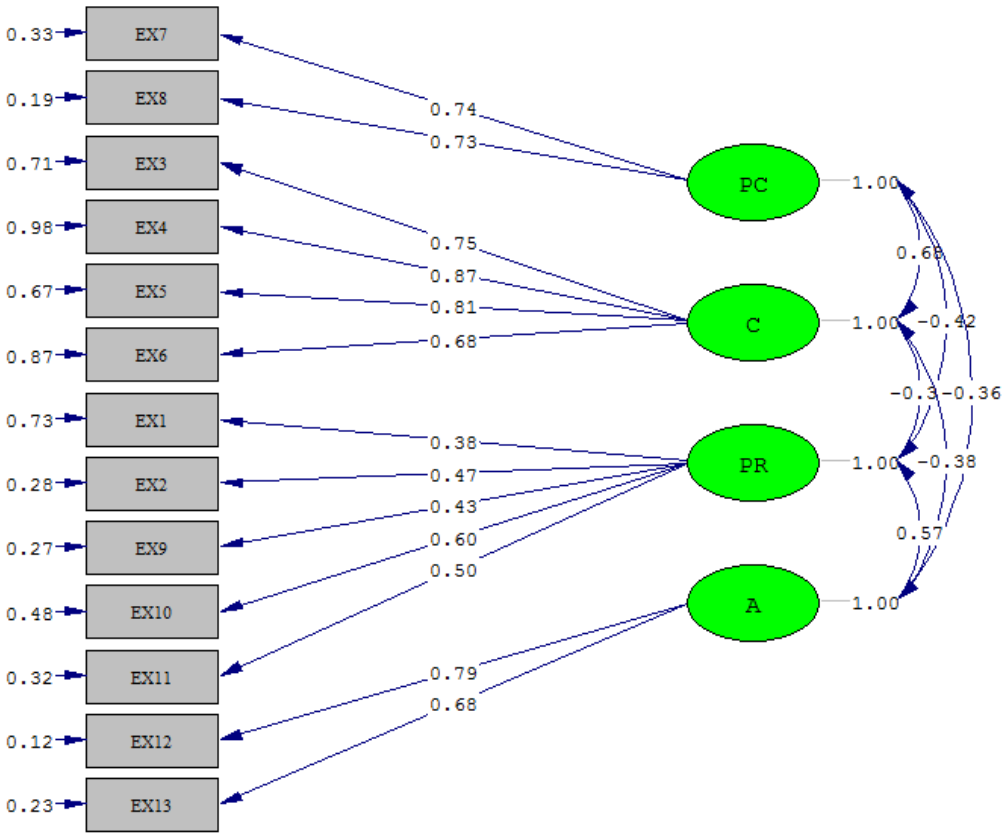

Figure 4 Four-factor correlated model of the RTC-EQ

Table 15 shows factor loadings (standardized and unstandardized), standard error, item reliability, factor score, and construct reliability of RTC-EQ measurement model. Each item produced a factor loading higher than .50. Despite one item Ex1from preparation factor had factor loading of .40. The ratios of unstandardized parameter estimates to their standard errors are greater than two indicated large sizes of factor loading.

Item reliability scores of each item were greater than .30 which represents a satisfied variance explained by their factors. However, item Ex1, "I strongly intend to exercise consistently as recommended within the next month", had low item reliability (.16) indicating its fair measure of preparation factor. This item is of concern for some revision. Construct reliability of RTC-EQ's subscale were exceed .70 indicating an acceptable internal consistency reliability. The results of the CFA suggested that the RTC-EQ model is validated.

Table 15 Factor Loading, Factor Score, and Construct Reliability of the RTC-EQ (n=533)

Factor	Standardized factor loading	Unstandardized factor loading	SE	t-value	R^2	Factor score	Construct reliability
Precontemplaton							.81
Ex 7	0.79	0.74	0.04	18.74	.63	0.37	
Ex 8	0.86	0.73	0.04	20.43	.74	0.63	
Contemplation							.75
Ex 3	0.66	0.75	0.05	15.32	.44	0.22	
Ex 4	0.66	0.89	0.06	15.20	.44	0.19	
Ex 5	0.70	0.81	0.05	16.38	.49	0.25	
Ex 6	0.59	0.68	0.05	13.27	.35	0.16	
Preparation							.75
Ex 1	0.40	0.38	0.04	8.67	.16	0.12	
Ex 2	0.66	0.47	0.0.3	15.18	.43	0.35	
Ex 9	0.64	0.43	0.03	14.61	.41	0.34	
Ex 10	0.66	0.60	0.04	15.17	.43	0.27	
Ex 11	0.67	0.51	0.03	15.37	.44	0.33	
Action							.86
Ex 12	0.92	0.79	0.04	21.71	.84	0.76	
Ex 13	0.82	0.68	0.04	19.33	.67	0.35	

Table 16 provides correlations among factors. Precontemplation (PC) scores were negatively related to the other factors are expected. It was found that PC scores were positively associated with contemplation factor scores with medium size correlation (.68) and significant at .05 level. This finding point out that, using RTC-EQ, Thai cardiac surgical participants who were in precontemplation stage have proportionately similar characteristic as those in contemplation stage.

Table 16 Correlations between factors of the RTC-EQ

	PC	C	PR	A
PC	1.00			
C	.68*	1.00		
PR	-.42*	-.39*	1.00	
A	-.36*	-.38*	.57*	1.00

* $p < .05$

1.3 Confirmatory factor analysis results for the RTC-NQ. The 4-factor model of the 13-item RTC-NQ is depicted in Figure 5. Results showed that only χ^2/df ratio indicated poor fit of the model (χ^2 = 206.11, df = 59, p = .000; χ^2/df ratio = 3.49; CFI=.97; GFI = 0.94; AGFI=.91; RMSEA = 0.06). Two covariance paths between measurement errors among items within contemplation factor were utilized. A respecified model showed a good fit to the data (χ^2 = 168.62, df = 57, p = .000; χ^2/df ratio = 2.96; CFI=.97; GFI = 0.95; AGFI=.93; RMSEA = 0.06).

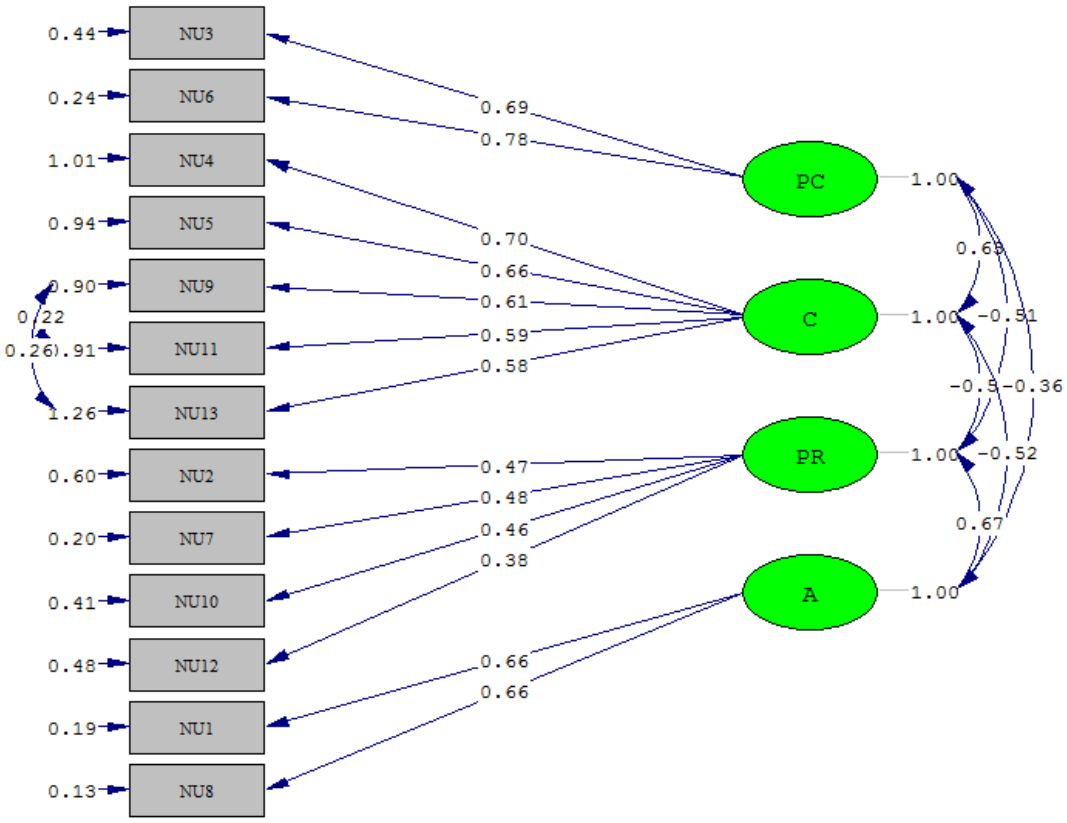

Figure 5 Four-factor correlated model of the RTC-NQ

Table 17 shows factor loadings, standard error, item reliability, factor score, and construct reliability of RTC-EQ measurement model. All items had factor loading higher than .50 which support the validity of the RTC-EQ.

Item reliability scores of most items were greater than .30, except item Nu13 from contemplation and item Nu12 from preparation subscale. The slightly low item reliability indicated that these to items had slightly less contributes to their factors. Construct reliability of precontemplation and action subscales subscale were exceed .70. While the reliability of contemplation and preparation subscales were .67 which is close to acceptable value. These finding still suggested an acceptable internal consistency reliability of the scale.

Table 17 Factor Loading, Factor Score, and Construct Reliability of the RTC-NQ (n=533)

Factor	Standardized factor loading	Unstandardized factor loading	SE	t-value	R^2	Factor score	Construct reliability
Precontemplaton							.76
Nu 3	0.72	0.69	0.05	15.54	.52	0.31	
Nu 6	0.85	0.78	0.04	17.83	.72	0.64	
Contemplation							.67
Nu 4	0.57	0.70	0.06	11.92	.33	0.20	
Nu 5	0.56	0.66	0.06	11.73	.32	0.20	
Nu 9	0.54	0.61	0.06	10.95	.29	0.13	
Nu 11	0.53	0.59	0.06	10.78	.28	0.16	
Nu 13	0.46	0.59	0.06	9.34	.21	0.11	
Preparation							.67
Nu 2	0.51	0.47	0.04	11.11	.27	0.18	
Nu 7	0.74	0.48	0.03	16.69	.54	0.58	
Nu 10	0.59	0.46	0.04	12.87	.34	0.26	
Nu 12	0.48	0.38	0.04	10.20	.23	0.18	
Action							.85
Nu 1	0.83	0.66	0.03	20.24	.69	0.47	
Nu 8	0.88	0.66	0.03	21.62	.78	0.72	

Table 18 provides correlations among factors. Precontemplation (PC) scores were negatively related to the other factors as seen in RTC-MQ and RTC-EQ. The PC scores were positively associated with contemplation factor scores with medium size correlation. This findings show that, using RTC-NQ, participants who were allocated into preconemplation stage have some similar characteristics as those in contemplation stage.

Table 18 Correlations between factors of the RTC-NQ

	PC	C	PR	A
PC	1.00			
C	.63*	1.00		
PR	-.51*	-.54*	1.00	
A	-.36*	-.52*	.67*	1.00

* p <.05

1.4 Confirmatory factor analysis results for the RTC-CQ. The 4-factor model of the 12-item RTC-CQ is displayed in Figure 6. Goodness of fit indices of the first model were χ^2 = 207.27, df = 48, p = .000; χ^2/df ratio = 4.32; CFI=.94; GFI = 0.94; AGFI=.90; RMSEA = 0.08. The χ^2/df ratio exceeded 3.00 and indicating differences between theoretical and observed relations. Covariance paths between measurement errors among items within contemplation and preparation factor were utilized. The respecified model was more fit to the data (χ^2 = 147.45, df = 45, p = .000; χ^2/df ratio = 3.27; CFI=.96; GFI = 0.96; AGFI=.93; RMSEA = 0.06). The χ^2/df ratio was decreased, however, it still slightly greater than 3.00. Modification indices that guide cross loading or covariance path between different factors were not accepted due to lack of theoretical explanation. Other goodness of fit indices still support the model fit to the data.

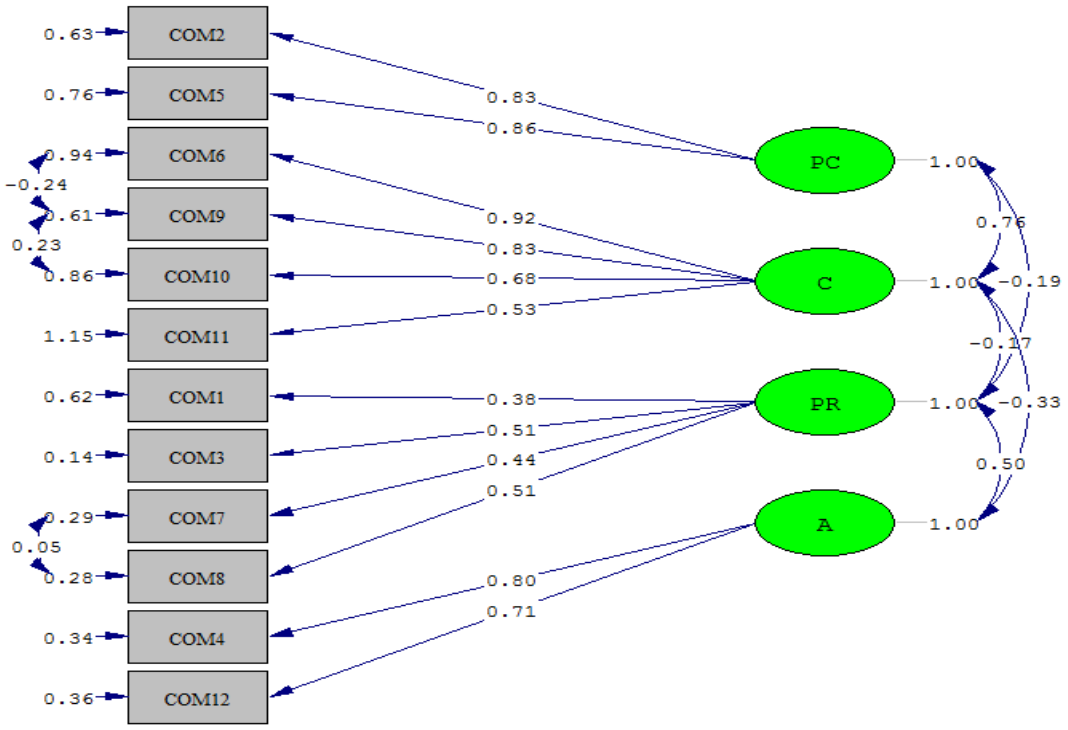

Figure 6 Four-factor correlated model of the RTC-CQ

Table 19 shows that factor loading higher than .50 for most of scale items. Despite one item Com1from preparation factor that had factor loading of .43. The ratios of unstandardized parameter estimates to their standard errors are greater than two indicated large sizes of factor loading. Hence, the factor loading scores support the validity of the RTC-CQ.

Testing the respecifiied model resulted in acceptable item reliability for most of the items except item Com10 and Com11 from contemplation subscale. The slightly low item reliability indicated that these two items had slightly less contributes to their factors. Construct reliability of contemplation, preparation, and action subscales were exceed .70. The reliability of precontemplation subscale was .67 which is close to acceptable value. These finding still suggested an acceptable internal consistency reliability of the scale.

Table 19 Factor Loading, Factor Score, and Construct Reliability of the RTC-CQ (n=533)

Factor	Standardized factor loading	Unstandardized factor loading	SE	t-value	R^2	Factor score	Construct reliability
Precontemplaton							.67
Com 2	0.72	0.83	0.05	15.80	.52	0.32	
Com 5	0.70	0.86	0.06	15.37	.49	0.28	
Contemplation							.71
Com 6	0.69	0.93	0.06	14.58	.48	0.27	
Com 9	0.73	0.84	0.06	14.25	.54	0.35	
Com 10	0.59	0.68	0.05	12.50	.20	0.06	
Com 11	0.45	0.53	0.06	9.65	.19	0.09	
Preparation							.74
Com 1	0.43	0.38	0.04	9.30	.66	0.13	
Com 3	0.81	0.51	0.03	17.61	.40	0.79	
Com 7	0.63	0.44	0.03	13.30	.48	0.26	
Com 8	0.69	0.51	0.03	14.81	.66	0.33	
Action							.77
Com 4	0.81	0.80	0.05	17.02	.66	0.50	
Com 12	0.76	0.71	0.04	16.18	.58	0.42	

Table 20 provides correlations among factors. Similar to the other RTC questionnaires, PC scores were negatively related to the other factors except contemplation factor. There was no inter-correlation between PC and A factor.

Table 20 Correlations between factors of the RTC-CQ

	PC	C	PR	A
PC	1.00			
C	.77*	1.00		
PR	-.21*	-.18*	1.00	
A	-	-.36*	.50*	1.00

* $p < .05$

1.5 Confirmatory factor analysis results for the RTC-SQ The results showed that the model was not well fitted to the data ($\chi^2 = 315.55$, df = 71, p = .000; χ^2/df ratio = 4.44; CFI=.91; GFI = 0.92; AGFI=.88; RMSEA = 0.08). Covariance paths between measurement errors among items within contemplation, preparation, and action factor were utilized. Figure 7 displays the respecified model. Fit indices of the respecified model are: $\chi^2 = 184.89$, df = 68, p = .000; χ^2/df ratio = 2.72; CFI=.96; GFI = 0.95; AGFI=.93; and RMSEA = 0.06. The fit indices reveal that the respecified model better fit to the data than the original model. The results of the confirmatory analysis suggested that the respecified model of the RTC-SQ was appropriate for the data.

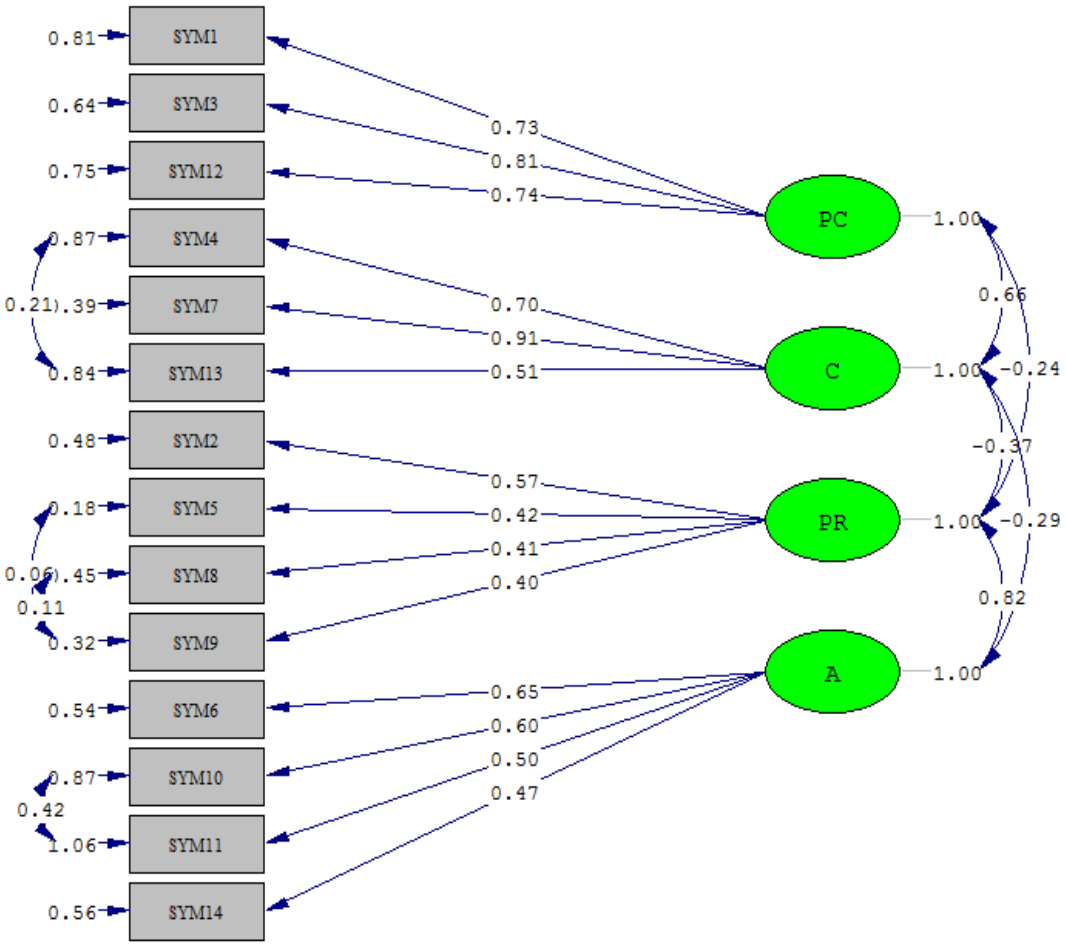

Figure 7 Four-factor correlated model of the 14-item RTC-SQ

Table 21 shows that factor loading higher than .50 for most of scale items. Despite one item Sym11from action factor that had factor loading of .44. The ratios of unstandardized parameter estimates to their standard errors are greater than two indicated large sizes of factor loading. Hence, the factor loading scores support the validity of the RTC-SQ.

Item reliability for most of the items was acceptable except item Sym13 from contemplation and Sym11 from action subscale. The slightly low item reliability indicated that these two items had slightly less contributes to their factors.

Construct reliability of precontemplation and contemplation subscales exceed .70 while that of action subscale was .63 which is slightly less than acceptable value. These finding still suggested an acceptable internal consistency reliability of the scale.

Table 21 Factor Loading, Factor Score, and Construct Reliability of the RTC-SQ (n=533)

Factor	Standardized factor loading	Unstandardized factor loading	SE	t-value	R^2	Factor score	Construct reliability
Precontemplaton							.70
Sym 1	0.63	0.73	0.05	13.70	.40	0.23	
Sym 3	0.71	0.81	0.05	15.64	.51	0.32	
Sym 12	0.65	0.74	0.05	14.20	.42	0.25	
Contemplation							.68
Sym 4	0.60	0.70	0.06	12.63	.36	0.16	
Sym 7	0.82	0.91	0.05	16.72	.68	0.53	
Sym 13	0.49	0.51	0.05	9.99	.24	0.10	
Preparation							.70
Sym 2	0.64	0.57	0.04	13.91	.40	0.30	
Sym 5	0.71	0.42	0.03	15.45	.50	0.54	
Sym 8	0.52	0.41	0.04	11.08	.27	0.19	
Sym 9	0.58	0.40	0.03	11.71	.33	0.15	
Action							.63
Sym 6	0.66	0.65	0.05	13.86	.44	0.33	
Sym 10	0.54	0.60	0.05	11.24	.29	0.16	
Sym 11	0.44	0.50	0.06	8.74	.19	0.07	
Sym 14	0.53	0.47	0.04	11.10	.28	0.23	

Table 22 provides correlations among factors. Similar to the other RTC questionnaires, PC scores were negatively related to the other factors except contemplation factor. There was no inter-correlation between PC and A factor.

Table 22 Correlations between factors of the RTC-SQ

	PC	C	PR	A
PC	1.00			
C	.66*	1.00		
PR	-.24*	-.37*	1.00	
A	-	-.29*	.82*	1.00

* p <.05

2. Convergent validity

Convergent validity refers to the evidence that the different measures of the same construct correlates highly with one another. In this study, convergent validity was evaluated using Cramer's V coefficients and classification agreements among RTC questionnaires and the readiness rulers.

Table 23 shows that percentage agreement of the readiness stage allocated by RTC questionnaires and readiness rulers were fair. The Cramer's v coefficients showed low correlates among stage allocated using two different measures. However, the low positive correlations with statistical significant was found in RTC-MQ and RR-medication. The result does not generally support the convergent validity of the readiness rulers.

Table 23 Convergent Validity of RTC Questionnaires and Readiness Rulers

	Percentage of agreement	Cramer's V coefficient
RTC-MQ vs. RR-medication taking	20.6	.10*
RTC-EQ vs. RR-exercise	25.5	.08
RTC-NQ vs. RR-nutrition taking	24.6	.06
RTC-CQ vs. RR-complication prevention	25.7	.06
RTC-SQ vs. RR-symptom management	22.7	.10

* $p < .05$

The stage allocation by RTC-questionnaires and readiness rulers for particular behavior are displayed in Figure 8. Using readiness rulers, participants were more likely to rate themselves into higher stages rather than earlier stages. The similar pattern was found in all five target behaviors.

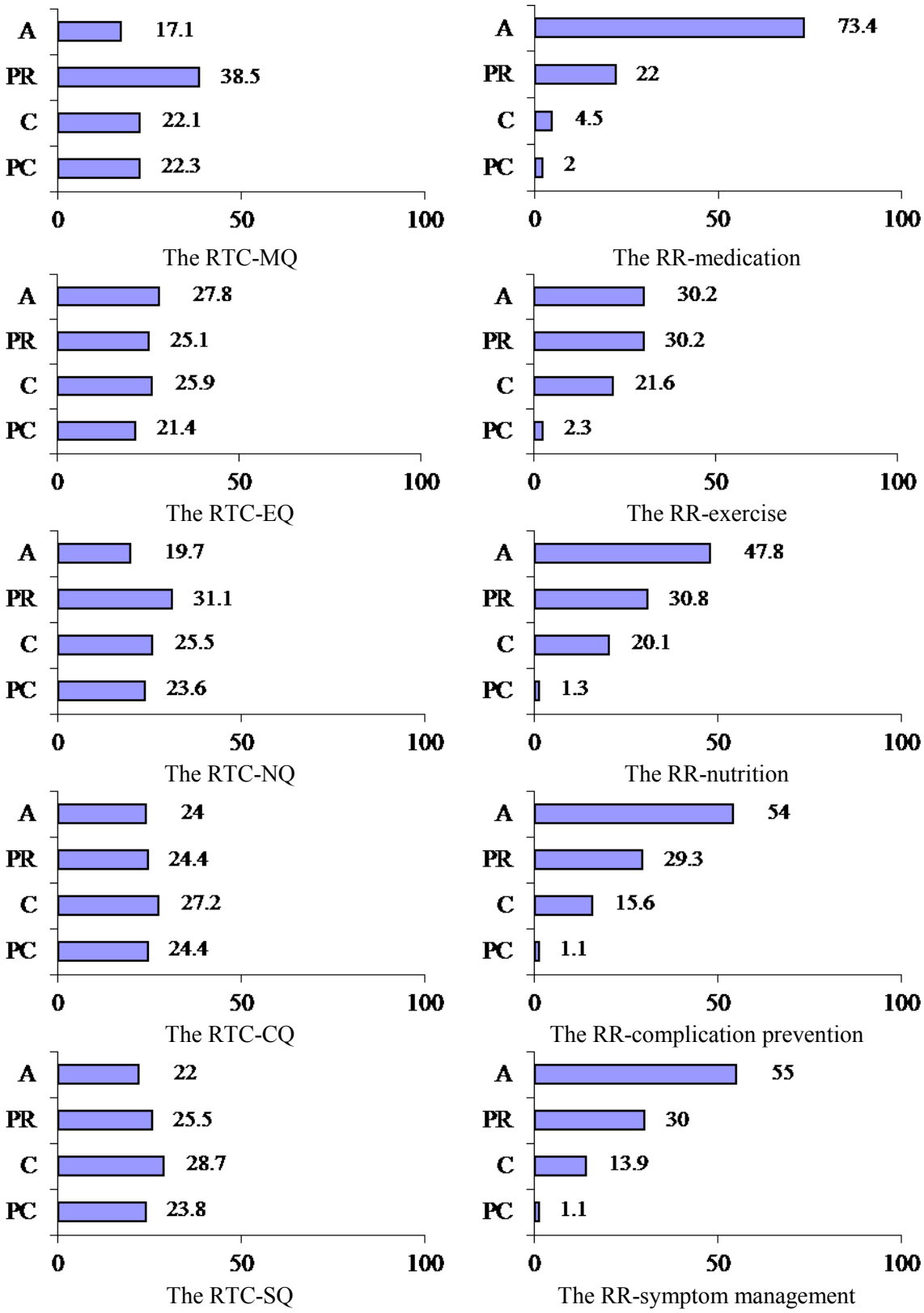

Figure 8 Comparison of Readiness Stage Classified by RTC Questionnaire vs. Readiness Rulers

CHAPTER V
CONCLUSIONS AND DISCUSSION

This chapter consists of summary and discussion of results, conclusion, and the recommendations for research and practice. The objectives of the study were: (1) To develop five RTC questionnaires and five readiness rulers corresponding to five health behaviors needed to facilitate recovery of Thai cardiac surgical patients; (2) To test psychometric properties of the newly developed scales; and (3) To compare these two scales in terms of their psychometric properties. Summary and discussion of the results are presented follow the objectives of the study. Recommendation for nursing research and practice are presented at the end of this chapter.

Objective 1 To develop five RTC questionnaires and five readiness rulers corresponding to five health behaviors needed to facilitate recovery of Thai cardiac surgical patients

Two formats of the scale to measure RTC on five cardiac health behaviors were developed in this study. The first format was the multi-item RTC questionnaire (continuous measure), and the second format was the readiness ruler. Five RTC self-reported questionnaires were developed. Each questionnaire was designed to classify the patient into four readiness stages (Precontemplation, Contemplation, Preparation, or Action). Each item was measured using a 5- point Likert scale (1= strongly disagree to 5 = strongly agree). To classify individual to a readiness stage, average score of each subscale were converted to T-score (mean = 50, SD = 10). The participant was assigned to a stage of readiness which shows the highest T-score.

The TTM postulates five stages of readiness which are precontemplation (PC), contemplation (C), preparation (PR), action (A), and maintenance (M) (Prochaska et al., 1992). The last stage was not applied in the measurement development in this study because the phenomenon of interested takes place within 3 month period. The maintenance stage that describes the person who has continued target behavior for more than six month is out of the scope of study.

The application of TTM to develop scale to measure RTC is varied based on characteristics of the population and target behaviors. The University of Rhode Island Change Assessment Scale (URICA) is the first and widely use questionnaire (McConnaughy et al., 1983). The URICA consisted of four stages which are PC, C, A, and M. A PR stage was not found from factor analysis results because the URICA was developed and test in psychotherapy patients who cannot differentiate PR from C and A stage. The URICA was developed for use in general behavior change. Target behavior was not specified. The word "problem" was used and this word allows later researchers modify this questionnaire to another chronic behaviors which the M stage is included by nature which is different from the present study (Amodei & Lamb, 2004; Nigg et al., 1999; Spencer et al., 2007).

The application of the in this study is similar to previous study that applied TTM to short behavior thus the M stage was excluded (Rollnick et al., 1992). The development of the scale this study that includes the items to measure PR stage is similar to previous studies such as the University of Rhode Island Change Assessment for Exercise (URICA-E2) that added preparation items and factor analysis support the PR stage (Reed, 1995).

During item generating process, the first item of PC stage was modified from the URICA-E2 item read "*I don't* exercise and right now *I don't care*". The word 'exercise' in the URICA-E2 was changed to target behaviors in RTC questionnaires in this study. The finding of the pilot study showed low corrected item-total correlations of this item in all RTC questionnaires and they were deleted from all RTC questionnaires. This finding is different from previous studies in Western population which this item always appear as a first item measuring PC stage (Khalil, 2011; Lerdal et al., 2009; McConnaughy et al., 1983; Reed, 1995). The words 'I don't..' or 'I don't care' are directly reflect that precontemplator has no intention to make change. Patients in Western countries may response directly that they have no intention to make change in their behaviors. In contrast, Thai patients always show social respect to their nurses. The traditional position of nurses in Thai society was highly respected because their roles determine that they help patients to improve their health and be healthy. When medicine or health recommendations are provided, patients seldom say no directly(Chunuan, Vanaleesin, Morkruengsai, & Thitimapong, 2007; Ekintumas, 1999). They may accept medications but not take them, or they may agree to follow the recommendation but fail to keep doing it. Hence, directly asking Thai patients that they have no intention to perform health behaviors recommended by nursed do not work in this study.

Five readiness rulers were developed in this study. The modification of the rulers has been discussed in detail in chapter 3 under the modifications of the instrument part. In sum, the original 0-7 readiness ruler had low convergent validity and some pilot participants complain about the confusing format. The readiness

rulers were re-modified to make them simpler for Thai participants who had elementary and high school level of education.

Objective 2 To test psychometric properties of the newly developed scales

The major purpose of this study was to investigate psychometric properties of Readiness to Change Cardiac Health Behaviors Scale (RTC-CHBS) which is composed of five RTC questionnaires (RTC-MQ, RTC-EQ, RTC-NQ, RTC-CQ, and RTC-SQ). Five readiness rulers were developed and tested for their validity and reliability. Specifically, the study was designed to establish the content and construct validity, as well as the reliability of RTC questionnaires and readiness rulers. Content validity of these instruments was determined by the consensus among four Thai experts in TTM use and cardiac surgery. Reliability of the RTC questionnaires were investigated by internal consistency reliability, and test–retest was established for readiness rulers. Construct validity of the instruments was studied by confirmatory factor analysis and convergent validity.

Validity and reliability of five RTC questionnaires and readiness rulers will be discuss in general first. After that some details of each instrument will be added.

Validity of the Instruments

Content Validity

Content validity of five RTC questionnaires and readiness rulers were examined by the I-CVI and S-CVI/Ave. I-CVIs of scale items were used as a guide for the selection or elimination of items in conjunction with experts' opinions. There was no suggestion for major change of any item. Only three items of the RTC-MQ, one item of the RTC-EQ, and one item of the RTC-CQ were required for rewording

based on experts' opinions. The fact that fewer item required minor revisions reflects that the content item of RTC questionnaire able to capture entire construct of RTC for each target behavior. The findings of the content validity study also indicated that readiness rulers were appropriate to measure RTC for each target behaviors based on experts' opinions.

The S-CVI/Ave reflects the CVI for entire scale based on average item quality evaluated by four experts (Polit & Beck, 2006). S-CVI/Ave of the RTC questionnaire was .96 for the RTC-MQ, .99 for the RTC-EQ and RTC-CQ, and 1.00 for the RTC-NQ and RTC-SQ. The CVI was 1.00 for all readiness rulers. The CVIS of the RTC questionnaires and the readiness rulers reflected a high agreement among content experts that item of these instruments were relevant to the purpose of RTC questionnaire which aim to classify Thai cardiac surgical patients into proper stage of readiness based on the TTM.

Construct Validity

Construct validity of the RTC questionnaires was determined by conducting a) confirmatory factor analysis to examine if the factor structure of RTC questionnaires fit the data, and b) convergent validity by calculating agreement of stage classification by RTC questionnaires and readiness rulers and correlating stage classification of two measures.

Confirmatory Factor Analysis. All RTC questionnaires were tested by confirmatory factor analysis (CFA). Multiple fit indices were used to assess whether the hypothesized model fit to the data. As suggested by Hair et al.(2010), the chi-square value, absolute fit index, incremental index, as well as parsimonious index

should be investigated for model fit. The χ^2/df ratio, CFI, GFI, AGFI, and RMSEA were utilized in this study. Moreover, factor loading score and square multiple correlations were used to evaluate construct validity of RTC questionnaires.

Four RTC questionnaire models (RTC-MQ, RTC-NQ, RTC-CQ, and RTC-SQ) needed respecified due to the χ^2/df ratio exceed 3.0 while the other fit indices were in acceptable value. The modification indices for the factor loading and measurement error variance matrices suggested that a significant drop in chi-square would be obtained if several measurement error terms were correlated. Even cross loading or between-construct error covariance will reduce chi-square value as suggested by the LISREL program, at the same time seriously construct validity will be occurred (Hair et al., 2010). Thus, only within-construct error covariance was allowed to be utilized.

Correlated error terms in measurement models represent the hypothesis that the unique variances of the associated indicators overlap; that is, they measure something in common other than the latent constructs that are represented in the model. Prior to allow within-construct error as suggested by the modification indices, item content of the RTC questionnaires was considered. For example, two covariance paths of error term between item med3 and med4, and between item med4 and med12 within contemplation factor were suggested by the modification indices. Item med3 is "ฉันอยากกินยาให้ได้ตามที่หมอสั่ง แต่ไม่รู้จะทำได้เมื่อไหร่." Item med4 is "ฉันอยากกินยาให้ได้ตามที่หมอสั่งแต่คงไม่ได้เพราะไม่มีคนช่วยจัดยาให้". Item med12 is "ฉันอยากกินยาให้ได้ตามที่หมอสั่ง แต่ฉันคิดว่ายากที่จะทำให้ได้". All these three items reflect some intention to

take medications as prescribed but the patient still has low confidence to be able to take medications as prescribed consistently. They have similar meaning but somewhat different in detail. It is possible that these items my trap some common thing other than attribute of contemplation stage of medication taking behavior and it may share their variances. Therefore, covariance paths between error terms of these three items were allowed. The chi-square value was reduced from 114.13 to 74.39, and ratio of χ^2/df was reduce from 3.9 to 2.75 which indicated better fit of the RTC-MQ model. Decision criteria to utilize covariance paths to RTC-MQ model was applied to the RTC-NQ, RTC-CQ, and RTC-SQ.

Findings from CFA showed that construct validity of RTC questionnaires were range from .68 to .84 for the RTC-MQ, .75 to .86 for the RTC-EQ, .67 to .85 for the RTC-NQ, .67 to .77 for the RTC-CQ, and .63 to .70 for the RTC-SQ. Construct reliability is one of the reliability estimated which is often used in conjunction with CFA model (Hair et al., 2010). It is computed from the squared sum of factor loadings for each factor and the sum of the error variance terms for each factor. Construct reliability value of .7 or higher suggests good reliability. Value between .6 and .7 is acceptable (Hair et al., 2010). According to measurement theory, latent variable is presumed to be the cause of the item value (DeVellis, 2012). Thus, in each factor of RTC questionnaire, item values are caused by their own latent variables which are the PC, C, PR, or A factor. If an item value is caused by a latent variable, then there should be a correlation between that value and the true score of the latent variable. As a sequence of each of the indicators correlating with the latent variable, they should correlate with each other (DeVellis, 2012). The results regarding the construct reliability of RTC questionnaire models in this study are the additional information

supported that internal consistency exists for each factor which means that RTC questionnaires' items all consistency represent the same readiness stage they are belonged to.

The results of the CFA supported that hypothesized 4-factor model of all RTC questionnaires fit the data well. Five RTC questionnaires developed in this study aim to classify Thai cardiac surgical patients to one of four stages of readiness which are PC, C, PR, and A. These findings support four factors that were conceptually in alignment with the RTC stage as postulated in the TTM (DiClemente, 2007; Prochaska & Norcross, 2001).

The present study developed RTC questionnaires based on stages of change of the TTM. The TTM suggests that individual possess five stages of readiness while he/she involve in behavior change process. Only four stages of readiness were applied in this study (PC, C, PR, and A) by the reason that target behaviors need continue behave for 3 months. Hence, the last stage of readiness (maintenance) which is defined as a continuation of behavior change for more than 6 month was excluded. Most of the instrument developed to measure RTC usually applied all five stages as recommended in TTM. Researchers apply the TTM to different phenomena, but it does not mean that all stages of RTC must be applied. It depends on the nature of target behavior and population of interest. For example, Rollnick and colleague developed the Readiness to Change Questionnaire (RTC) based on four stages as was the URICA (PC, C, A, and M). The RTCQ was tested in the excessive alcohol consumers with low level of dependence who are not formally seeking help for drinking problems. Items were selected from the URICA and reduce from 28 to 12 items. A principle component analysis revealed a clear structure corresponding to PC,

C, and A. These three factors accounted for two third of the total variance. A factor corresponds to the maintenance stage was not found because seldom of the sample are in maintenance. This means that maintenance stage had little relevance to population of the study (Rollnick et al., 1992). Thus, the RTCQ measures only three stages which are PC, C, and A. This previous study results reveal that in some behaviors or population, maintenance stage may not be included which is similar to the present study.

The present study developed RTC questionnaires with include items to measure PR factor which is different from some previous studies. The URICA developed by McConnaughy and other (1983) and the RTCQ developed by Rollnick and colleague (1992) did not include items to measure PR stage. However, results of the present study showed that PR stage exists in RTC stages along the process of change regarding five health behaviors among Thai cardiac surgical population. Findings of the present study are consistent with the results of Reed's study. Reed (1995) developed the URICA-E2 in replication of the work done by McConnaughy et al., (1983) and McConnaughy et al., (1989). The URICA-E2 was developed to measure RTC for exercise in general population. It was distributed to a convenience sample of adult, and it was found that not only preparation had been add to precontemplation, contemplation, action, and maintenance, but precontemplation had split in two factors (PC-nonbeliever and PC-believer). Validation of the six factor model was done using confirmatory factor analysis. The correlated six-factor model was proved to have the best fit. After that, the English version URICA-E2 was translated into Norwegian and tested in 198 nursing students. The principle

component analysis confirmed six factor structure of this instrument (Lerdal et al., 2009).

Correlations among the RTC questionnaire factors with statistically significant were found as expected. The five RTC stages represent an increasing intent to change one's behaviors, from no intention to change (PC), to beginning to considering change (C), to readiness to change in the near future (PR), to early enacting of the behavior change (A), and to maintain the change (M)(Jezewski et al., 2009; Prochaska, 2008). Each RTC stage represents a constellation of tasks that create the foundation for movement forward in the process of change. The tasks build on each other so that the end product of the process is a new, sustained pattern of behavior that is supported by the adequate accomplishment of each of the preceding tasks (DiClemente, 2007). Statistical significant correlations among factors in each RTC questionnaire are supported by this theoretical explanation. The findings also revealed that the RTC stages conceptually close to each other show a higher correlation than between more distant stage. For example, correlations among factor in RTC-MQ showed that PC correlated with C factor with higher correlation coefficient (r=.64) than PC and PR (r =-.42) or PC and A (r =-.39).

Significant positive correlations between PC and C factor were observed. The correlation between PC and C factor were ranged from .63-.77. The PC score was expected to negatively correlate with C, PR, and A score. AS defined by the definition, individual has no intention to change while individual in C start to think about the change. The possible reason for this finding is the content of PC item of RTC questionnaires in this study. As mentioned earlier regarding the first item of PC

stage in all RTC questionnaires which were eliminated from the scale. The deleted item directly reflect that Thai cardiac surgical patient do not think to make any change on medication taking, exercise, nutrition taking, complication prevention, or symptom management behavior. The elimination of this item may makes a different in the direction of the correlations between PC and C factor compared to previous studies in Western population (Figlie, Dunn, Bazan, & Larenjeira, 2005; Polascheck, Anstiss, & Wilson, 2011; Reed, 1995). The positive correlations between PC and C factor in this study is similar to the study of Lerdal and other (2008). Lerdal and other tested the Norwegian version URICA-E2 and found that PC factor scores were positively correlated with C factor score, bur the magnitude of correlations were lower than the present study (r = .27-.41). The moderate to high correlations between PC and C factor in this study suggest that study's participants had difficulty discriminating between these two factors in their response.

Convergent validity

Roughly, one fourth (20.6% – 25.7%) of participants were assigned to equivalent stages using two different methods. Poor agreement between the RTC-questionnaires and readiness rulers suggested that these two measures had somewhat different ability. There are four possible reasons to explain this finding.

The first possible reason is the complexity of target behaviors in this study which are the medication taking, exercise, nutrition taking, complication prevention, and symptom management. Readiness ruler is considered as a single-item measure. A single-item measure of psychological constructs tends to have poor reliability (Nunnally & Bernstein, 1994). Multi-item measure can represent more aspects of a

multifaceted construct, whereas single-item can be more ambiguous and opens to differing interpretation (Napper et al., 2008). The RTC for cardiac health behavior is a complex construct which is composed of intention, actual behaviors, and duration attributes (Lippke et al., 2009), The RTC questionnaires are the multi-item measure that could better capture the structure of RTC for cardiac health behaviors better than single-item readiness ruler. Previous studies revealed good convergent validity of these two formats of instrument might be due to less complex behavior. The study of the readiness rulers for safe sex and condom use showed good convergent validity between the ruler and the Readiness to Change Questionnaire. Correlations of these two measures were .77 for both behaviors (LaBrie et al., 2005).

The second possible explanation is that The RTC questionnaires and the readiness rulers may assess similar constructs. Since the readiness ruler was developed for a long time. The first developer of the ruler aimed to apply the ruler to assess patient's readiness in an easy way. Practitioners often need an assessment of readiness to change that is quick and able to identify patients who would best benefit from motivational enhancement therapies (Rollnick et al., 1992). At the beginning, the developer did not link the readiness stage to the stages of change of the TTM. Later the readiness ruler was applied to use with various behaviors especially for measuring patient's readiness stage to provide stage-matched intervention based on the TTM.

Miller and Rollnick (1991) used the stages of change model in their seminal work. They viewed the stages as a continuum of motivational readiness for changing behavior. Progress along the change continuum is an important aspect of a successful

intervention (Prochaska et al., 1992). Many researchers have used the stages of change model to develop the idea of "readiness to change," a measure looking at the motivation of participants to change a desired behavior. In this way, it seems that the term "motivation" and "readiness to change" are used interchangeably. Readiness to change represents a more pragmatic and focused view of motivation (DiClemente et al., 2004). Motivational readiness to change has also been described using the tasks of the stages of change in order to suggest intervention strategies. Sometimes RTC score from RTC measures were used to represent motivation.

Readiness ruler was applied to various behaviors and previous studies shows that the readiness ruler has acceptable convergent validity compared to outcome criteria (Chung et al., 2011; Harris et al., 2008; Heather et al., 2008). Currently convergent validity of the ruler has been tested by comparing to the RTC measures. The readiness ruler showed good convergent validity (Heather et al., 2008; LaBrie et al., 2005). However, it may be proved in uncomplicated behavior as mentioned earlier in the first explanation.

The third explanation is related to the scoring system. In Labrie's study, items in the precontemplation subscale were reversed coded and added to the scores of items from the contemplation and action factors. This score yield the single "readiness to change" factor that refers to the motivation to decrease drinking. Using different scoring system give a different result (Stephen, Cellucci, & Gregory, 2004). Assigning participants into RTC stage based on the highest score gave unrelated convergent validity (r =-.11, ns), while using total RTC score (C+A+M-PC) yielded more correlation (r=.24, ns). The RTC questionnaires developed in this study use the

highest T-score to assign participants into a proper RTC stage which contribute to the poor convergent validity.

The fourth explanation is the effect of social desirability bias. The previous studies provide convergent validity evidence of the readiness ruler in Western population. The present study tries to validate the readiness rulers in Thai cardiac surgical population. Thai patients my rate themselves in a higher stage because they would like to represent themselves as cooperation patients. As evidence by the higher percentage of participant in action stage using readiness rulers than using RTC questionnaires.

Reliability of the Instruments

The Cronbach's alpha reliability of RTC questionnaire was .67-.70 for RTC-MQ, .72-.86 for RTC-EQ, .65-.84 for RTC-NQ, .67-.76 for RTC-CQ, and .68-.73 for RTC-SQ. In general, reliability of RTC questionnaires were in acceptable value which is above or close to .70 (Nunnally & Bernstein, 1994). These findings suggested that the RTC questionnaires possessed an acceptable internal consistency for further use of these instruments in applied studies.

Among five questionnaires, the RTC-CQ and RTC-SQ showed lower alpha reliability than RTC-MQ, RTC-EQ, and RTC-NQ. It is possible that of the more complex of RTC for complication prevention behavior which was measured by the RTC-CQ and the RTC for symptom management behavior which was assessed by the RTC-SQ. These two behaviors consist of various activities need to be performed by

the cardiac surgical patients. Further studies in depth for the refinement of RTC-CQ and RTC-SQ are required.

Considering in each item of RTC questionnaires, it was found that the first preparation's item of all questionnaires showed the lowest corrected item-total reliability (ranged from .30 to .42) compared to other items (Appendix E). This item talks about intention of the patient to perform such behavior within 30 days. Final results are similar to the findings of pilot study. These items had low item-total correlations and they were reworded to make them clearer. They are subjected to reconsider the time frame for each behavior.

One month timeframe for preparation stage which has been guided by the TTM might not well suitable for the recovery after cardiac surgery. Especially for the five significant behaviors that should be performed immediately. Previous studies utilized a different timeframes to assess an individual stage of readiness. For instance, the application of the TTM using 2-year period for preparation stage (instead of 1 month) to provide stage-matched intervention to encourage screening mammography (Rakowski et al., 1998). Using TTM framework to investigate the adoption of improved study skills in a university population with 13-week period, the preparation stage was operationalized as intention to make change within the next week (Grant & Franlin, 2007). Several criticisms have focused on operationalization using theoretical timeframes. The stage definitions are viewed as being problematic because it seems unclear whether the chosen time frame is actually the proper one. Timeframes for defining stages may be more or less appropriate for different behaviors. Three implications were suggested: (a) assessment using only qualitative characteristics of

readiness stage; (b) timeframes might be studied in more depth; and (c) substitutes for timeframes (Lippke et al., 2009).

Most of the participants in this study were within 14 days after surgery (72.8%). The RTC questionnaires were developed for cardiac surgical patients who undertaken cardiac surgery within one day through three months recovery period. It was difficult to set exact timeframes during item generating process due to the variation of duration after surgery. If most of the patients are within 14 days postoperative period, it means that most of them are in pre-hospital discharge period or come to the hospital for first follow-up visit. During tis 14 days, cardiac surgical patients are more likely to confront serious complications than later period. Hence, preparation timeframes should be revised to 2-3 days or within one week. This new timeframe will match to the patient within 14 days recovery, while 1 month seem to more general for patients within 1 days to 3 months recovery period.

The test-retest findings also revealed the substantial stability of five readiness rulers in regards to their ability to classify Thai cardiac surgical patients into the same stage over the given time frame. The percentage of agreement which is used to determine the absolute agreement between the two sets of scores was selected (Waltz et al., 2010). The percentage of agreement of readiness rulers was ranges from 77.5 to 88.0%. Kappa coefficients were .65-.70. These findings indicated substantial stability of the readiness rulers in Thai cardiac surgical sample for 30 minutes time frame.

Objective 3 To compare RTC questionnaire and readiness rulers in terms of their psychometric properties

The RTC questionnaires were tested for content validity, construct validity using CFA, and reliability using internal consistency coefficients. The readiness rulers were assessed for content validity, construct validity using convergent validity, and reliability using test-retest reliability. RTC questionnaires were support for all validity and reliability testing while readiness rulers possess content validity and test-retest reliability only. Since there is no gold standard for the RTC measure for the behaviors of interest in this study, RTC questionnaires which was accepted as psychometrically sound by the results of the present study were used as comparison measures for convergent validity testing. However, findings of this study fail to support construct validity of the readiness rulers. Moreover, readiness ruler are more likely to be affected by the social desirability bias as evidence by the finding that using readiness rulers, participants were more likely to rate themselves into higher stages rather than earlier stages. The similar pattern was found in all five target behaviors.

Based on the current findings, RTC questionnaires appear superior to the ruler in terms of robust psychometric properties. Five RTC questionnaires were tested for their psychometric properties and accepted as a valid and reliable instrument to apply among Thai cardiac surgical patients. Readiness rulers are short and easy, and were accepted as a reliable measure by test-retest reliability. However, construct validity of readiness ruler are not supported by the results of this study. Since there is no gold standard for convergent validity testing and RTC questionnaires are newly developed scales, conclusion on the validity of readiness rulers cannot be provided.

Conclusion

Classification of cardiac surgical patients into the right stage of readiness to change is a critical step in assigning stage-matched intervention. Without a valid and reliable measure, an accurate classification of patient's stage of readiness cannot be achieved. Although there are several measures for readiness to change, none of them were developed for Thai cardiac surgical patients. Especially, none of them were developed in regards to medication taking, exercise, nutrition taking, complication prevention, and symptom management behaviors during early recovery period after cardiac surgery.

This is the first study to develop instruments to measure patient readiness to change for five behaviors that facilitate recovery during 3 months post cardiac surgery. Five RTC questionnaires and five readiness rulers were developed in the present study, and they were modified based on the findings of the pilot study. In this study, content and construct validity, as well as internal consistency and test-retest reliability were evaluated.

Findings related to validity indicated that RTC questionnaires and readiness rulers had acceptable content validity. The strong evidence of construct validity of RTC questionnaires was demonstrated by the confirmatory factor analysis. However, convergent validity results fail to support validity of RTC questionnaires and readiness rulers. The RTC questionnaires possessed acceptable internal consistency reliability while readiness rulers hold satisfactory test-retest reliability. The RTC questionnaires are appropriate to assess RTC on five health behaviors during early

recovery period in Thai cardiac surgical patients and recommended to be used both in in research and practice area.

Recommendation for Clinical Practice

Five RTC questionnaires which were developed in this study consist of RTC-MQ, RTC-EQ, RTC-NQ, RTC-CQ, and RTC-SQ which were design to assess RTC for medication taking, exercise, nutrition taking, complication prevention, and symptom management among Thai cardiac surgical patients. These RTC questionnaires are accepted as valid and reliable instruments. These questionnaires are suggested for use in clinical setting combined with discharge planning. They can be used to assess RTC for each behavior before giving stage-matched interventions. They are suggested to be used as evaluation measures to follow patient's readiness periodically when nurses provide continuing care regarding the promotion of health behavior during recovery period. Thus, RTC questionnaire can be used in cardiac surgical unit, outpatient department, and in homecare setting.

These five RTC questionnaires are suggested for use by professional nurses. Manual for using RTC questionnaire should be utilized to ensure the effectiveness of instruments administration. Detail related to direction of use, target population, scoring system, as well as how to design stage-matched intervention should provide in the manual. Specifically, nurses who will be beneficial for these RTC questionnaires should have specific knowledge related to nursing care for the cardiac surgical patients. All five RTC questionnaires were developed to cover five critical behaviors needed to be performed by cardiac surgical patients. It does't mean that all

questionnaires have to provide to the patient at the same time. Nurses have to evaluate individual case and prioritize his or her critical problematic behavior. Then select only some RTC questionnaires that match to individual needs.

Recommendation for Further Research

Five RTC questionnaires developed in this study are accepted as accurately measure to assess patient's readiness to change which has beneficial in development of staged-matched interventions. However, further studies are needed to:

1. Cross validate each of five questionnaires in Thai cardiac surgical patients for more psychometric properties such as criterion related validity with actual behaviors or some outcome variables. External validation with related construct from the TTM such as process of change, decisional balance, and/or self-efficacy would make more benefit as well.

2. Two RTC questionnaires which are the RTC-CQ and RTC-SQ showed lower internal consistency compared to the other three RTC questionnaires. Since this study developed five RTC questionnaires simultaneously, it was difficult to study each RTC questionnaire in depth. Complication prevention behavior and symptom management behaviors of cardiac surgical patients during early recovery period are more critical and complex than medication taking, exercise, and nutrition taking behaviors. Further study is needed for the refinement of RTC-CQ and RTC-SQ.

3. Sample of this study include all adult cardiac surgical patients including coronary artery bypass graft surgery, valve surgery, and septum closer surgery patients. RTC questionnaire items are appropriate for all cardiac surgical patients. Some specific items such as item that talking about the patient's behavior to prevent

complication of leg incision in CABG case were eliminated. Further study in subgroup of cardiac surgical patient such as in CABG or in valve surgery are suggested.

4. Further study in subgroup of the cardiac surgical patients also recommended in CABG patients with Diabetes. Since major problem of post cardiac surgical patients is wound infection which is high risk for the patients with Diabetes. Uncontrolled plasma glucose that contributed to infection is related to oral hypoglycemic drug taking, nutrition taking, and complication prevention behavior. Since early period postoperative, patients usually have poor appetite. Oral hypoglycemic drugs usually taped down. When the patients discharge home, appetite will regained within 1-2 weeks. Serum glucose should be monitored and diet should be adjusted to prevent the rapid raising of serum glucose that increase rate of infection. Findings of this study showed that around 20% of the participants had Diabetes. If focus only on CABG patient, the result showed that 41% of CABG patient had Diabetes. RTC questionnaires developed in this study are more general and less specific to capture RTC of behaviors for a specific group.

5. Concurrent validity and predictive validity of the RTC questionnaires are suggested for further study.

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Appendices

Appendix A

First Draft of the RTC Questionnaires items and the Readiness Rulers

The First Draft RTC-Medication Taking Items

Precontemplation

med 1 ฉันไม่ได้คิดเรื่องการกินยาหลังผ่าตัด
med 12 ถ้าหลังผ่าตัดจะลืมกินยาบ้าง คงไม่มีปัญหาอะไรมาก
med 13 .....
med 14 .....
med 15 .....
med 23 .....

Contemplation

med 2 ฉันพอจะรู้ว่าช่วงแรกๆหลังผ่าตัดหัวใจ ต้องกินยาให้ตรงตามที่หมอสั่งไปอีกสักพักจนกว่าจะหายดี
med 3 ฉันไม่แน่ใจว่าจะกินยาได้ตามที่หมอสั่งทุกมื้อ
med 7 .....
med 8 .....
med 9 .....
med 10 .....
med 11 .....
med 16 .....
med 17 .....
med 24 .....
med 25 .....

Preparation

med 5 ฉันจะกินยาตามหมอสั่งอย่างเคร่งครัดให้ได้ ภายใน 1 เดือนข้างหน้า
med 6 .....
med 18 .....
med 19 .....
med 20 .....
med 26 .....
med 27 .....
med 28 .....

Action

med 4 ฉันกินยาตรงตามที่หมอสั่งอย่างเคร่งครัดมาได้สักพักแล้ว แต่ยังไม่ถึง 3 เดือน
med 21 .....
med 22 .....

The First Draft RTC- Exercise Items

Precontemplation

ex 1 ฉันไม่ได้คิดเรื่องการออกกำลังกายหลังผ่าตัด

ex12 .....

ex13 .....

ex14 .....

ex15 .....

Contemplation

ex 2 การออกกำลังกายหลังผ่าตัดทำให้ฉันหายเร็วขึ้น

ex 3 .....

ex 7 .....

ex 8 .....

ex9 .....

ex10 .....

Preparation

ex 5 ฉันจะออกกำลังกายหลังผ่าตัดให้ได้ตรงตามคำแนะนำภายใน 1 เดือน

ex 6 ฉันตั้งใจอ่านเอกสารเกี่ยวกับการออกกำลังกายหลังผ่าตัด

ex11 .....

ex16 .....

ex17 .....

ex18 .....

ex19 .....

ex 20 .....

Action

ex 4 ฉันออกกำลังกายหลังผ่าตัดตามที่แนะนำทุกวันมาได้สักพักแต่ยังไม่ถึง 3 เดือน

ex21 .....

ex22 .....

The First Draft RTC-Nutrition Taking Items

Precontemplation

nu 1 ฉันไม่ได้คิดถึงเรื่องการกินอาหารตามคำแนะนำหลังผ่าตัด
nu 5 .....
nu 9 .....
nu13 .....

Contemplation

nu3 ฉันคิดว่าการกินอาหารตามคำแนะนำหลังผ่าตัดทำให้ฉันหายเร็วขึ้น
nu 7 .....
nu 8 .....
nu12 .....
nu15 .....
nu18 .....
nu 20 .....

Preparation

nu 4 ฉันตั้งใจจะกินอาหารตามคำแนะนำหลังผ่าตัดให้ได้ภายใน 1 เดือนข้างหน้า
nu 10 .....
nu14 .....
nu16 .....
nu17 .....
nu19 .....
nu21 .....

Action

nu 2 ฉันคอยเตือนตัวเองว่าต้องกินอาหารตามคำแนะนำหลังผ่าตัดให้ได้แบบนี้จนกว่าจะหายดี
nu 6 .....
nu11 .....

The First Draft RTC-Complication Prevention Items

Precontemplation

com 1 ฉันไม่ได้คิดว่าจะต้องคอยสังเกตอาการผิดปกติหลังผ่าตัดของตัวเอง

com 5 .....

com 9 .....

Contemplation

com 2 ถึงฉันจะกลับบ้านได้แล้วหลังผ่าตัด ฉันยังต้องดูแลแผลของตัวเอง

com 6 .....

com10 .....

com11 .....

com 14 .....

com 16 .....

com 18 .....

com 19 .....

com22 .....

com24 .....

Preparation

com 3 ฉันจะฝึกตัวเองให้คอยดูแลแผล วัดไข้ จับชีพจร และชั่งน้ำหนักให้ได้ทุกวัน ภายใน 1 เดือนข้างหน้า

com 7 .....

com 12 .....

com 15 .....

com17 .....

com 20 .....

com 21 .....

com23 .....

com 25 .....

com 26 .....

Action

com 4 ฉันทำตามที่พยาบาลแนะนำเรื่องการดูแลแผลผ่าตัดและการเต้นของหัวใจ ทุกวัน แต่ยังไม่ถึง 3 เดือน

com 8 .....

com 13 .....

com 27 .....

The First Draft RTC-Symptom Management Items

Precontemplation

sym 1 ฉันไม่ได้คิดว่าหลังผ่าตัดฉันต้องคอยจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ
sym 5 .....
sym 9 .....
sym15 .....

Contemplation

sym 2 ฉันต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัด ฉันจะได้หายเร็วขึ้น
sym 6 .....
sym 10 .....
sym 16 .....
sym 19 .....

Preparation

sym 3 ฉันมั่นใจว่าฉันสามารถจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับของฉันได้ดีภายใน 1 เดือนข้างหน้า
sym 7 .....
sym 11 .....
sym 12 .....
sym 17 .....
sym 18 .....
sym 20 .....

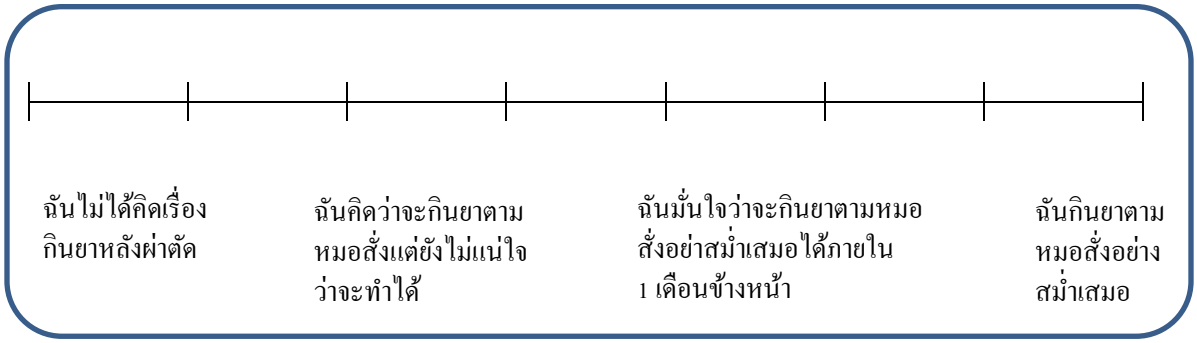
Action

sym 4 ฉันทำทุกอย่างตามที่พยาบาลสอนเพื่อจัดการอาการปวดแผลท้องผูก นอนไม่หลับ แต่ยังไม่ถึง 3 เดือน
sym 8 .....
sym 13 .....
sym 14 .....
sym 21 .....

มาตรวัดความพร้อมในการรับประทานยา

การรับประทานยา หมายถึง ท่านกินยาหลังผ่าตัดตรงตามแพทย์สั่งอย่างสม่ำเสมอทุกวัน โดยกินยาถูกต้องตรงตามชนิดของยา จำนวนยา และเวลา โดยไม่มีการปรับเปลี่ยนยาเอง สำหรับยาบางชนิดที่มีคำสั่งแพทย์ให้กินตามอาการ เช่นยาแก้ปวด ยาแก้ท้องผูก หรือยานอนหลับ ท่านสามารถประเมินอาการและกินยาเพื่อบรรเทาอาการต่างๆของท่านได้อย่างเหมาะสม

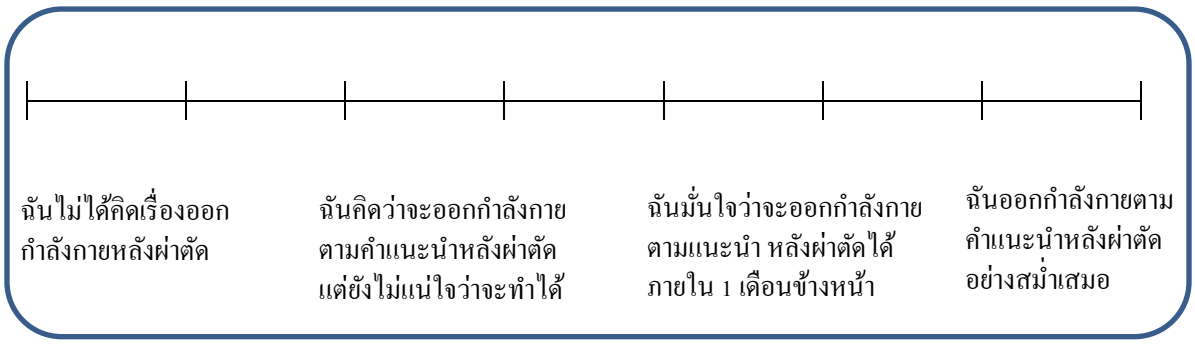
กรุณาทำเครื่องหมายกากบาท X ลงบนเส้นตรงตำแหน่งที่ตรงกับความรู้สึกของท่านในขณะนี้



มาตรวัดความพร้อมในการออกกำลังกาย

การออกกำลังกาย หมายถึง ท่านออกกำลังกายหลังผ่าตัดตามคำแนะนำของแพทย์หรือพยาบาล โดยการเดินออกกำลังกายหลังผ่าตัดทุกวัน และค่อยๆเพิ่มเวลาการเดินขึ้นครั้งละ 5 นาที/สัปดาห์ ถ้าไม่รู้สึกเหนื่อย จนกระทั่งสามารถเดินได้อย่างต่อเนื่อง 30 นาที รวมทั้งการนับชีพจรก่อนและหลังการออกกำลังกายทุกครั้ง

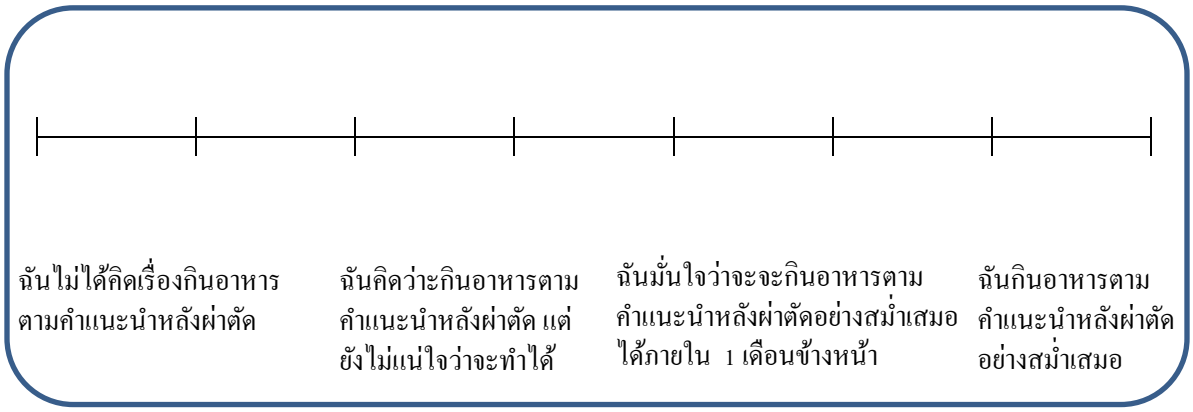
กรุณาทำเครื่องหมายกากบาท X ลงบนเส้นตรงตำแหน่งที่ตรงกับความรู้สึกของท่านในขณะนี้



มาตรวัดความพร้อมในการรับประทานอาหาร

การรับประทานอาหาร หมายถึง การกินอาหารหลังผ่าตัดหัวใจตามคำแนะนำของแพทย์/พยาบาลที่มุ่งเน้นการส่งเสริมการหายในช่วงหลังผ่าตัด โดยกินอาหารครบทั้ง 5 หมู่ เพิ่มการกินอาหารประเภทเนื้อสัตว์ ไข่ ผัก ผลไม้ ลดการกินอาหารไขมันสูง และอาหารที่มีรสเค็มจัด หรือหวานจัด

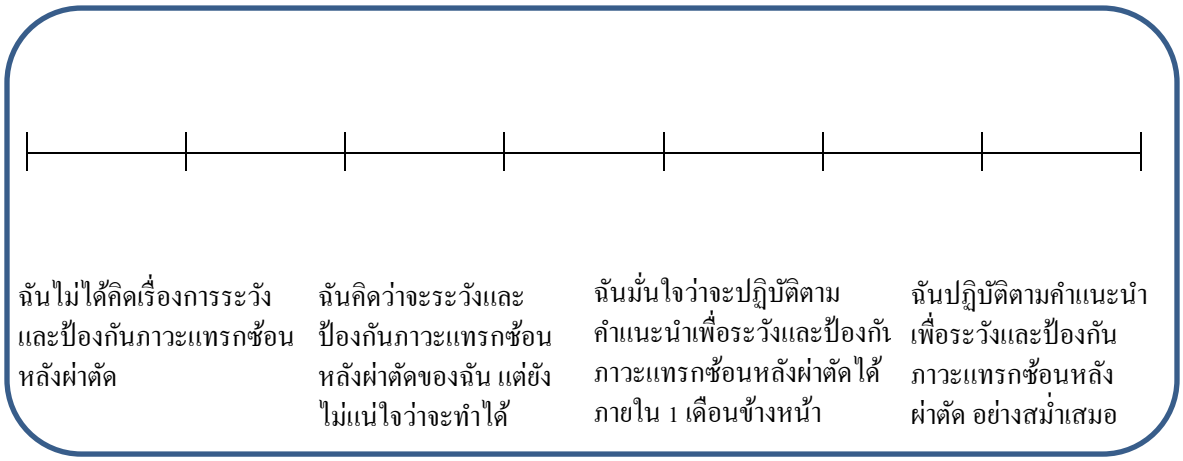
กรุณาทำเครื่องหมายกากบาท X ลงบนเส้นตรงตำแหน่งที่ตรงกับความรู้สึกของท่านในขณะนี้



มาตรวัดความพร้อมในการระวังและป้องกันภาวะแทรกซ้อน

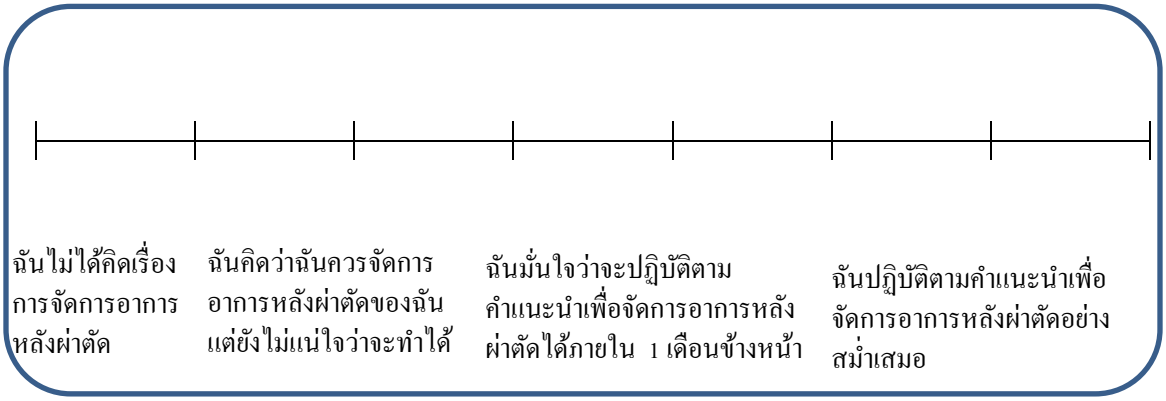
การระวังและป้องกันภาวะแทรกซ้อน หมายถึง ท่านปฏิบัติตามคำแนะนำของแพทย์และพยาบาลในการดูแลแผลผ่าตัด ประเมินอาการติดเชื้อของแผล การทำงานของหัวใจ และรายงานแพทย์/พยาบาลทันทีเมื่อพบอาการผิดปกติเกิดขึ้นกับตัวท่านในช่วงหลังผ่าตัดหัวใจ

กรุณาทำเครื่องหมายกากบาท X ลงบนเส้นตรงตำแหน่งที่ตรงกับความรู้สึกของท่านในขณะนี้



มาตรวัดความพร้อมในการจัดการอาการ

การจัดการอาการ หมายถึง ท่านใช้การกินยาตามคำแนะนำของแพทย์พยาบาล รวมทั้งวิธีการอื่นๆที่ท่านเรียนรู้จาก/แพทย์/พยาบาล หรือผู้ป่วยคนอื่น เพื่อบรรเทาอาการปวดแผล ท้องผูก นอนไม่หลับ ที่เกิดขึ้นกับท่านหลังผ่าตัดหัวใจ กรุณาทำเครื่องหมายกากบาท X ลงบนเส้นตรงตำแหน่งที่ตรงกับความรู้สึกของท่านในขณะนี้



Appendix B

The Second Draft of the RTC questionnaires items

The Second Draft RTC-Medication Taking Items

Precontemplation

Med 5 ถ้าแผลผ่าตัดหายดีก็คือหายแล้ว ไม่ต้องกังวลเรื่องการกินยา

Med 6 .....

Med 11 .....

Contemplation

Med 3 ฉันอยากกินยาให้ได้ตามที่หมอสั่ง แต่ไม่รู้ว่าฉันจะทำได้เมื่อไร

Med 4 .....

Med 7 .....

Med 12 .....

Preparation

Med 1 ฉันตั้งใจแน่วแน่ว่าจะกินยาตามหมอสั่งอย่างเคร่งครัดให้ได้ภายใน 1 เดือนข้างหน้า

Med 2 .....

Med 8 .....

Action

Med 9 ตอนนี้ฉันกินยาหลังผ่าตัดตรงตามที่หมอสั่งทุกมื้ออยู่แล้ว และจะพยายามทำให้ได้อย่างนี้ไปตลอด

Med 10 .....

The Second Draft RTC-Exercise Items

Precontemplation

Ex 7 ถึงไม่ออกกำลังกายหลังผ่าตัด ฉันก็หายจากโรคหัวใจเหมือนคนอื่น

Ex 8 ……

Contemplation

Ex 3 ฉันรู้ว่าควรออกกำลังกายหลังผ่าตัด แต่ฉันไม่ค่อยมีเวลา

Ex 4 ……

Ex 5 ……

Ex 6 ……

Preparation

Ex 1 ฉันตั้งใจแน่วแน่ว่าจะออกกำลังกายให้ได้ตรงตามคำแนะนำภายใน 1 เดือนข้างหน้า

Ex 2 ……

Ex 9 ……

Ex 10 ……

Ex 11 ……

Action

Ex 12 ฉันออกกำลังกายหลังผ่าตัดตามคำแนะนำทุกวันและจะพยายามทำให้ได้อย่างนี้ไปตลอด

Ex 13 ……

The Second Draft RTC-Nutrition Taking Items

Precontemplation

Nu 3 หลังผ่าตัด กินอาหารอะไรก็ได้ ขอให้กินได้มากๆ

Nu 6 .....

Contemplation

Nu 4 ฉันไม่มั่นใจว่าจะกินแต่อาหารที่มีประโยชน์ งดหวาน มัน เค็ม หลังผ่าตัดได้

Nu 5 .....

Nu 9 .....

Nu 11 .....

Nu 13 .....

Preparation

Nu 2 ฉันตั้งใจแน่วแน่ ว่าจะกินอาหารอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ภายใน 1 เดือน ข้างหน้า

Nu 7 .....

Nu 10 .....

Nu 12

Action

Nu 1 ฉันคอยเตือนตัวเองว่าต้องกินอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ ทุกวันแบบนี้จนกว่าจะหายดี

Nu 8 .....

The Second Draft RTC-Complication Prevention Items

Precontemplation

Com 2 ถ้าฉันมาพบหมอตามนัด หมอจะดูแลเรื่องแผลผ่าตัดและอาการทั่วไปของฉันอยู่แล้ว ฉันไม่จำเป็นต้องทำอะไร

Com 5 .....

Contemplation

Com 6 ฉันควรระวังเรื่องแผลติดเชื้อ และสังเกตการเต้นผิดจังหวะของหัวใจหลังผ่าตัด แต่ตอนนี้ฉันยังไม่ได้ทำ

Com 9 .....

Com 10 .....

Com 11 .....

Preparation

Com 1 ฉันตั้งใจแน่วแน่ว่าจะดูแลแผลผ่าตัด วัดไข้ จับชีพจร และชั่งน้ำหนักตัวเองทุกวัน ภายใน 1 เดือนข้างหน้า

Com 3 .....

Com 7 .....

Com 8 .....

Action

Com 4 ฉันชั่งน้ำหนักตัว และจับชีพจรทุกวัน และจะพยายามทำให้ได้อย่างนี้ไปตลอด

Com 12 .....

The Second Draft RTC-Symptom Management Items

Precontemplation

Sym 1 ฉันไม่ได้คิดว่าหลังผ่าตัดฉันต้องคอยจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ

Sym 3 .....

Sym 12 .....

Contemplation

Sym4 ฉันต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัด แต่ตอนนี้ทำได้บ้างไม่ได้บ้าง

Sym 7 .....

Sym 13 .....

Preparation

Sym 2 ฉันตั้งใจแน่วแน่ว่าจะจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับของ ฉันเอง ภายใน 1 เดือนข้างหน้า

Sym 5 .....

Sym 8 .....

Sym 9 .....

Action

Sym 6 ฉันมีวิธีที่ทำให้ฉันนอนหลับตอนกลางคืนได้ดีมาตลอด

Sym 10 .....

Sym 11 .....

Sym 14 .....

Appendix C

The Final Draft of the RTC Questionnaires and Readiness Rulers

The RTC-Medication Taking Questionnaire
แบบประเมินความพร้อมในการรับประทานยา

การรับประทานยา	หมายถึง ท่านกินยาหลังผ่าตัดตรงตามแพทย์สั่งอย่างสม่ำเสมอทุกวัน โดยกินยาถูกต้องตรงตามชนิดของยา จำนวนยา และเวลา โดยไม่มีการปรับเปลี่ยนยาเอง สำหรับยาบางชนิดที่มีคำสั่งแพทย์ให้กินตามอาการ เช่นยาแก้ปวด ยาแก้ท้องผูก หรือยานอนหลับ ท่านสามารถประเมินอาการและกินยาเพื่อบรรเทาอาการต่างๆของท่านได้อย่างเหมาะสม

กรุณาอ่านข้อความต่อไปนี้ และเลือกคำตอบที่ตรงกับตัวท่านมากที่สุด โดยทำเครื่องหมาย √ ลงในช่องด้านขวามือ

เกณฑ์ในการตอบคำถาม

1 = ท่าน*ไม่เห็นด้วยอย่างยิ่ง* กับข้อความนั้น
2 = ท่าน*ไม่เห็นด้วย* กับข้อความนั้น
3 = ท่าน*ไม่แน่ใจ*
4 = ท่าน*เห็นด้วย* กับข้อความนั้น
5 = ท่าน*เห็นด้วยอย่างยิ่ง* กับข้อความนั้น

	ไม่เห็นด้วยอย่างยิ่ง [1]	ไม่เห็นด้วย [2]	ไม่แน่ใจ [3]	เห็นด้วย [4]	เห็นด้วยอย่างยิ่ง [5]
1. ฉันตั้งใจแน่วแน่ว่าจะกินยาตามหมอสั่งอย่างเคร่งครัดให้ได้ภายใน 1 สัปดาห์					
2. ฉันตั้งใจฟังเวลาพยาบาลสอนและอ่านเอกสารเกี่ยวกับยาที่ฉันต้องกินหลังผ่าตัด					
3. ฉันอยากกินยาให้ได้ตามที่หมอสั่ง แต่ไม่รู้ว่าฉันจะทำได้เมื่อไร					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Precontemplation = item 5, 6, 9
Contemplation = item 3, 4, 10
Preparation = item 1, 2
Action = item 7, 8

The RTC-Exercise Questionnaire
แบบประเมินความพร้อมในการออกกำลังกาย

การออกกำลังกาย	หมายถึง ท่านออกกำลังกายหลังผ่าตัดตามคำแนะนำของแพทย์หรือพยาบาล โดยการเดินออกกำลังกายทุกวัน และค่อยๆเพิ่มเวลาการเดินขึ้นครั้งละ 5 นาที/สัปดาห์ จนกระทั่งเดินได้อย่างต่อเนื่อง 30 นาที รวมทั้งการนับชีพจรก่อนและหลังการออกกำลังกายทุกครั้ง

กรุณาอ่านข้อความต่อไปนี้ และเลือกคำตอบที่ตรงกับตัวท่านมากที่สุด โดยทำเครื่องหมาย √ ลงในช่องด้านขวามือ

เกณฑ์ในการตอบคำถาม

1 = ท่าน*ไม่เห็นด้วยอย่างยิ่ง* กับข้อความนั้น
2 = ท่าน*ไม่เห็นด้วย* กับข้อความนั้น
3 = ท่าน*ไม่แน่ใจ*
4 = ท่าน*เห็นด้วย* กับข้อความนั้น
5 = ท่าน*เห็นด้วยอย่างยิ่ง* กับข้อความนั้น

	ไม่เห็นด้วยอย่างยิ่ง [1]	ไม่เห็นด้วย [2]	ไม่แน่ใจ [3]	เห็นด้วย [4]	เห็นด้วยอย่างยิ่ง [5]
1. ฉันตั้งใจแน่วแน่ว่าจะออกกำลังกายให้ได้ตรงตามคำแนะนำภายใน 1 สัปดาห์					
2. ฉันตั้งใจอ่านเอกสารเกี่ยวกับการออกกำลังกายหลังผ่าตัด					
3. ฉันรู้ว่าควรออกกำลังกายหลังผ่าตัด แต่ฉันไม่ค่อยมีเวลา					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					

Precontemplation = item 7, 8
Contemplation = item 3, 4, 5, 6
Preparation = item 1, 2, 9, 10, 11
Action = item 12, 13

The RTC-Nutrition Taking Questionnaire
แบบประเมินความพร้อมในการรับประทานอาหาร

การรับประทานอาหาร	หมายถึง การกินอาหารตามคำแนะนำของแพทย์/พยาบาลเพื่อมุ่งเน้นการส่งเสริมการหายในช่วงหลังผ่าตัด โดยกินอาหารครบทั้ง 5 หมู่ เพิ่มการกินอาหารประเภทเนื้อสัตว์ ไข่ ผัก ผลไม้ ลดการกินอาหารไขมันสูง อาหารที่มีรสเค็มจัด หรือหวานจัด

กรุณาอ่านข้อความต่อไปนี้ และเลือกคำตอบที่ตรงกับตัวท่านมากที่สุด โดยทำเครื่องหมาย √ ลงในช่องด้านขวามือ

เกณฑ์ในการตอบคำถาม

1 = ท่าน*ไม่เห็นด้วยอย่างยิ่ง* กับข้อความนั้น
2 = ท่าน*ไม่เห็นด้วย* กับข้อความนั้น
3 = ท่าน*ไม่แน่ใจ*
4 = ท่าน*เห็นด้วย* กับข้อความนั้น
5 = ท่าน*เห็นด้วยอย่างยิ่ง* กับข้อความนั้น

	ไม่เห็นด้วยอย่างยิ่ง [1]	ไม่เห็นด้วย [2]	ไม่แน่ใจ [3]	เห็นด้วย [4]	เห็นด้วยอย่างยิ่ง [5]
1. ฉันคอยเตือนตัวเองว่าต้องกินอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ทุกวันแบบนี้จนกว่าจะหายดี					
2. ฉันตั้งใจแน่วแน่ ว่าจะกินอาหารอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ภายใน 1 สัปดาห์					
3. หลังผ่าตัด กินอาหารอะไรก็ได้ ขอให้กินได้มากๆ					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					

Precontemplation = item 3, 6 Contemplation = item 4, 5, 9, 11, 13

Preparation = item 2, 7, 10, 12 Action = item 1, 8

The RTC-Complication Prevention Questionnaire
แบบประเมินความพร้อมในการระวังและป้องกันภาวะแทรกซ้อน

การระวังและป้องกันภาวะแทรกซ้อน	หมายถึง ท่านปฏิบัติตามคำแนะนำของแพทย์และพยาบาลในการดูแลแผลผ่าตัด ประเมินอาการติดเชื้อของแผล การทำงานของหัวใจ และรายงานแพทย์/พยาบาลทันทีเมื่อพบอาการผิดปกติที่เกิดขึ้นกับตัวท่านในช่วงหลังผ่าตัดหัวใจ

กรุณาอ่านข้อความต่อไปนี้ และเลือกคำตอบที่ตรงกับตัวท่านมากที่สุด โดยทำเครื่องหมาย √ ลงในช่องด้านขวามือ

เกณฑ์ในการตอบคำถาม

1 = ท่าน*ไม่เห็นด้วยอย่างยิ่ง* กับข้อความนั้น
2 = ท่าน*ไม่เห็นด้วย* กับข้อความนั้น
3 = ท่าน*ไม่แน่ใจ*
4 = ท่าน*เห็นด้วย* กับข้อความนั้น
5 = ท่าน*เห็นด้วยอย่างยิ่ง* กับข้อความนั้น

	ไม่เห็นด้วยอย่างยิ่ง [1]	ไม่เห็นด้วย [2]	ไม่แน่ใจ [3]	เห็นด้วย [4]	เห็นด้วยอย่างยิ่ง [5]
1. ฉันตั้งใจแน่วแน่ว่าจะดูแลแผลผ่าตัด วัดไข้ จับชีพจร และชั่งน้ำหนักตัวเองทุกวัน ภายใน 2-3 วันนี้					
2. ถ้าฉันมาพบหมอตามนัด หมอจะดูแลเรื่องแผลผ่าตัด และอาการทั่วไปของฉันอยู่แล้ว ฉันไม่จำเป็นต้องทำอะไร					
3. ฉันตั้งใจฟังเวลาพยาบาลสอนเกี่ยวกับการดูแลแผลผ่าตัด และการสังเกตุอาการผิดปกติหลังผ่าตัด					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

Precontemplation = item 2, 5 Contemplation = item 6, 9, 10, 11

Preparation = item 1, 3, 7, 8 Action = item 4, 12

The RTC-Symptom Management Questionnaire
แบบประเมินความพร้อมในการจัดการอาการ

การจัดการอาการ	หมายถึง ท่านจัดการอาการปวดแผล ท้องผูก หรือ นอนไม่หลับช่วงหลังผ่าตัดของท่าน โดยการกินยา รว่วมกับวิธีอื่นๆตามที่แพทย์/พยาบาลแนะนำ หรือจากการเรียนรู้จากผู้ป่วยที่มีประสบการณ์

กรุณาอ่านข้อความต่อไปนี้ และเลือกคำตอบที่ตรงกับตัวท่านมากที่สุด โดยทำเครื่องหมาย √ ลงในช่องด้านขวามือ

เกณฑ์ในการตอบคำถาม

1 = ท่าน *ไม่เห็นด้วยอย่างยิ่ง* กับข้อความนั้น
2 = ท่าน *ไม่เห็นด้วย* กับข้อความนั้น
3 = ท่าน *ไม่แน่ใจ*
4 = ท่าน *เห็นด้วย* กับข้อความนั้น
5 = ท่าน *เห็นด้วยอย่างยิ่ง* กับข้อความนั้น

	ไม่เห็นด้วยอย่างยิ่ง [1]	ไม่เห็นด้วย [2]	ไม่แน่ใจ [3]	เห็นด้วย [4]	เห็นด้วยอย่างยิ่ง [5]
1. ฉันไม่ได้คิดว่าหลังผ่าตัดฉันต้องคอยจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ					
2. ฉันตั้งใจแน่วแน่ว่าจะจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับของฉันเอง ภายใน 2-3 วันนี้					
3. ฉันคิดว่าผ่าตัดแล้วโรคหัวใจจะหายขาด เรื่องอาการปวดแผล ท้องผูก และนอนไม่หลับไม่สำคัญ					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					

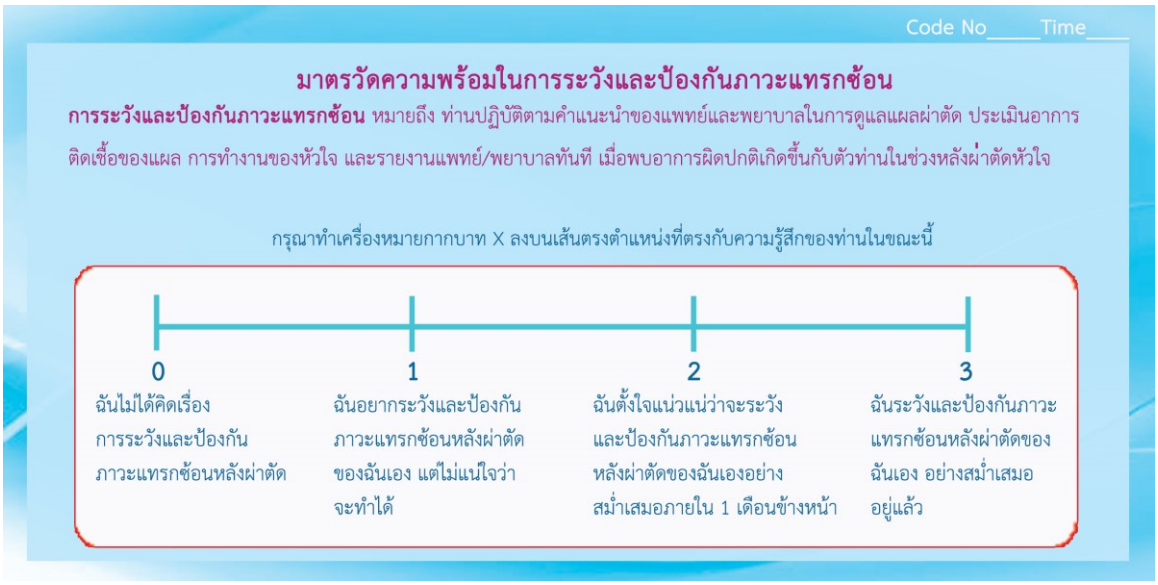
Precontemplation = item 1, 3, 12
Contemplation = item 4, 7, 13
Preparation = item 2, 5, 8, 9
Action = item 6, 10, 11, 14

Readiness Ruler for Medication Taking

Readiness Ruler for Exercise

Readiness Ruler for Nutrition Taking

Readiness Ruler for Complication Prevention



Readiness Ruler for Symptom Management

Appendix D

Demographic Data Form

แบบสอบถาม งานวิจัย เรื่อง

การพัฒนาเครื่องมือประเมินความพร้อมในการปฏิบัติพฤติกรรมสุขภาพหัวใจ

Code No.....
โรงพยาบาล.....
ผู้เก็บข้อมูล.....
วันที่เก็บข้อมูล.....

แบบบันทึกข้อมูลส่วนบุคคล

(สำหรับผู้วิจัย/ผู้ช่วยวิจัย เป็นผู้บันทึก)

1. อายุ ..... ปี
2. เพศ ☐ ชาย (1) ☐ หญิง (2)
3. ระดับการศึกษา
   ☐ ไม่ได้เรียน (1) ☐ ประถมศึกษา (2)
   ☐ มัธยมศึกษา (3) ☐ ประกาศนียบัตร (4)
   ☐ ปริญญาตรี (5) ☐ ปริญญาโท (6)
   ☐ อื่นๆ (7) ระบุ .....
4. ชนิดการผ่าตัด
   ☐ Coronary Artery Bypass Graft (CABG) (1)
   ☐ Aortic Valve Replacement (AVR) (2) ☐ Mitral Valve Replacement (MVR) (3)
   ☐ Tricuspid Valve Replacement (TVR) (4) ☐ Pulmonic Valve Replacement (PVR) (5)
   ☐ Heart Valve Repair (6) ระบุ.....
   ☐ Closure VSD (7) ☐ Closure ASD (8)
   ☐ CABG + AVR (9) ☐ CABG + MVR (10)
   ☐ CABG + VSD (11) ☐ CABG + ASD (12)
   ☐ MVR + AVR (13)
   ☐ TV repair + C-ASD (14) ☐ AV repair + C-VSD (15)
   ☐ Other (16).....
7. วันที่ทำผ่าตัด.....
8. ระยะเวลาหลังผ่าตัด.....วัน
9. โรคร่วม ☐ Hypertension ☐ Dyslipidemia ☐ DM
   ☐ Renal disease ☐ Gout ☐ smoking ☐ Other.....

Appendix E

Reliability Analysis of RTC Questionnaire And Hypothesized Models from CFA Results

Table 1 Means, Standard Deviations, Corrected Item-Total Correlations, Subscale Reliabilities, and Reliability if Item Deleted of the RTC-MQ (n=533)

Subscale/item		Mean	SD	Corrected item-total correlation	α if item deleted	Subscale's reliability
Precontemplation						.67
Med 5	ถ้าแผลผ่าตัดหายดีก็คือหายแล้ว ไม่ต้องกังวลเรื่องการกินยา	1.95	1.15	.49	.58	
Med 6	ถึงจะกินยาบ้าง ไม่กินบ้างคงไม่เป็นไรเพราะผ่าตัดแล้ว	1.55	.83	.54	.50	
Med 11	หลังผ่าตัดไม่มีความจำเป็นต้องกินยาอีก คิดเรื่องนี้เสียเวลาเปล่า	1.53	.88	.43	.62	
Contemplation						.65
Med 3	ฉันอยากกินยาให้ได้ตามที่หมอสั่ง แต่ไม่รู้ว่าฉันจะทำได้เมื่อไร	2.59	1.34	.48	.54	
Med 4	ฉันอยากกินยาให้ตรงตามหมอสั่ง แต่คงไม่ได้เพราะแม่มีคนช่วยจัดยาให้	2.04	1.14	.58	.47	
Med 7*	ฉันรู้ว่าการกินยานั้นสำคัญ แต่ฉันรู้สึกเบื่อที่จะกิน	2.04	1.12	.25	.69	
Med 12	ฉันอยากกินยาให้ครบตามที่หมอสั่ง แต่ฉันคิดว่ายากที่จะทำได้	2.03	1.08	.42	.58	
Preparation						.51
Med 1	ฉันตั้งใจแน่วแน่ว่าจะกินยาตามหมอสั่งอย่างเคร่งครัดให้ได้ภายใน 1 เดือนข้างหน้า	4.59	.62	.35	37	
Med 2	ฉันตั้งใจฟังเวลาพยาบาลสอนและอ่านเอกสารเกี่ยวกับยาที่ฉันต้องกินหลังผ่าตัด	4.53	.59	.46	.21	
Med 8*	ฉันมั่นใจว่า ฉันมีวิธีที่ทำให้ฉันสามารถกินยาตามหมอสั่งได้	4.20	.86	.21	.67	
Action						.70
Med 9	ตอนนี้ฉันกินยาหลังผ่าตัดตรงตามที่หมอสั่งทุกมื้ออยู่แล้ว และจะพยายามทำให้ได้อย่างนี้ไปตลอด	4.57	.67	.54	-	
Med 10	ฉันกินยาได้ตรงตามหมอสั่งทุกมื้ออยู่แล้ว และคอยเตือนตัวเองว่าคอยทำต่อไปจนกว่าจะหายดี	4.50	.78	.54	-	

* items were deleted

Table 2 Means, SD, Corrected Item-Total Correlations, Subscale Reliabilities, and Reliability if Item Deleted of the RTC-EQ (n=533)

Subscale/item		Mean	SD	Corrected item-total correlation	α if item deleted	Subscale's reliability
Precontemplation						.81
Ex 7	ถึงไม่ออกกำลังกายหลังผ่าตัด ฉันก็หายจากโรคหัวใจเหมือนคนอื่น	1.79	.93	.68	-	
Ex 8	ฉันคิดว่าผ่าตัดแล้วโรคหัวใจก็จะหยขาด ไม่จำเป็นต้องออกกำลังกาย	1.68	.85	.68	-	
Contemplation						.75
Ex 3	ฉันรู้ว่าควรออกกำลังกายหลังผ่าตัด แต่ฉันไม่ค่อยมีเวลา	2.32	1.13	.55	.31	
Ex 4	ฉันอยากรอให้แข็งแรงก่อนแล้วค่อยคิดเรื่องการออกกำลังกายหลังผ่าตัด	2.54	1.32	.55	.32	
Ex 5	ฉันรู้ว่าควรออกกำลังกายหลังผ่าตัดแต่จำขั้นตอนไม่ได้	2.69	1.15	.60	.36	
Ex 6	ถ้าฉันออกกำลังกายหลังผ่าตัดฉันคงฟื้นตัวเร็วขึ้น แต่ฉันคงทำได้ไม่ดี	2.72	1.16	.47	.25	
Preparation						.72
Ex 1	ฉันตั้งใจแน่วแน่ว่าจะออกกำลังกายให้ได้ตรงตามคำแนะนำภายใน 1 เดือนข้างหน้า	4.18	.93	.32	.75	
Ex 2	ฉันตั้งใจอ่านเอกสารเกี่ยวกับการออกกำลังกายหลังผ่าตัด	4.27	.71	.56	.65	
Ex 9	ฉันตั้งใจฟังเวลาที่พยาบาลสอนเรื่องการออกกำลังกายหลังผ่าตัด	4.33	.68	.50	.68	
Ex 10	ฉันคุยกับคนไข้ที่ผ่าตัดหัวใจเรื่องการออกกำลังกายหลังผ่าตัด	3.97	.92	.56	.65	
Ex 11	ฉันถามหมอ/พยาบาลว่าฉันควรออกกำลังกายหลังผ่าตัดอย่างไร	4.17	.76	.54	.66	
Action						.86
Ex 12	ฉันออกกำลังกายหลังผ่าตัดตามคำแนะนำทุกวันและจะพยายามทำให้ได้อย่างนี้ไปตลอด	4.19	.86	.75	-	
Ex 13	ฉันออกกำลังกายหลังผ่าตัดตามคำแนะนำทุกวันและเตือนตัวเองเสมอว่าต้องทำต่อไปจนกว่าจะหายดี	4.35	.83	.75	-	

Table 3 Means, SD, Corrected Item-Total Correlations, Subscale Reliabilities, and Reliability if Item Deleted of the RTC-NQ (n=533)

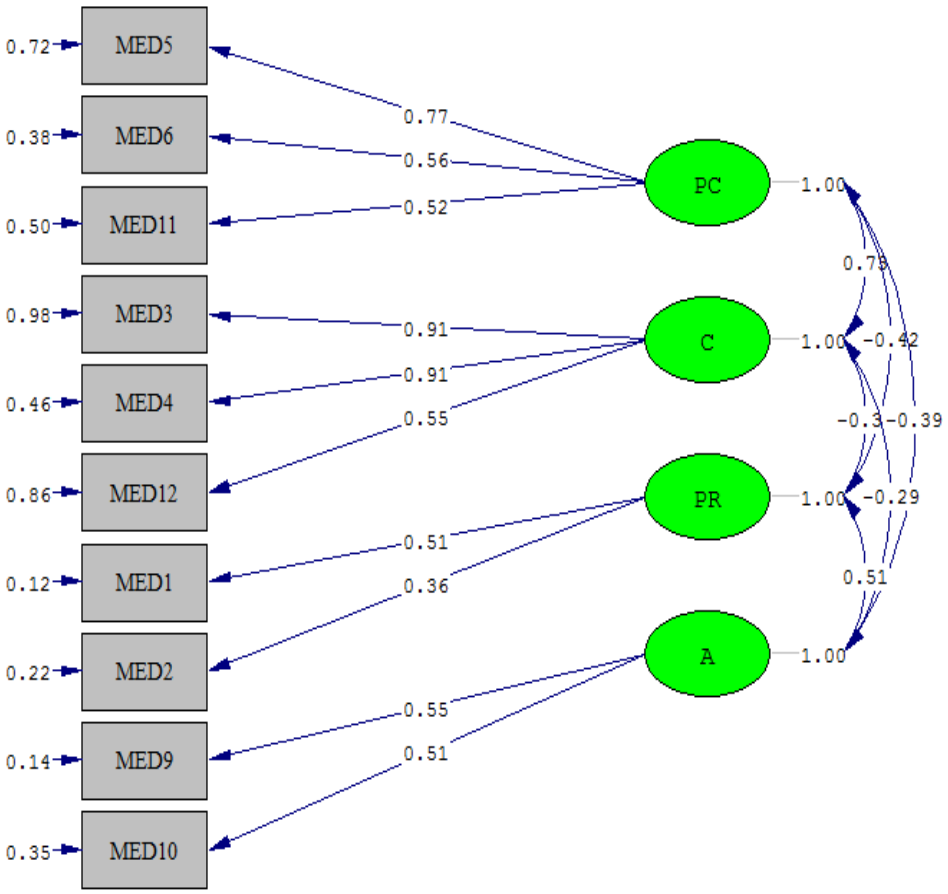
Subscale/item		Mean	SD	Corrected item-total correlation	α if item deleted	Subscale's reliability
Precontemplation						.76
Nu 3	หลังผ่าตัด กินอาหารอะไรก็ได้ ขอให้กินได้มากๆ	1.97	.96	.61	-	
Nu 6	ฉันจะหายเร็วหรือช้าหลังผ่าตัด ไม่น่าเกี่ยวกับอาหารที่ฉันกิน	1.86	.92	.61		
Contemplation						.70
Nu 4	ฉันไม่มั่นใจว่าจะกินแต่อาหารที่มีประโยชน์ งดหวาน มัน เค็ม หลังผ่าตัดได้	2.50	1.22	.43	.66	
Nu 5	กินอาหารที่มีประโยชน์ งดหวาน มัน เค็ม เป็นสิ่งดี แต่คงเป็นไปไม่ได้ที่จะทำตามได้ทุกอย่าง	2.70	1.17	.41	.67	
Nu 9	การกินอาหารที่มีประโยชน์ งดอาหาร หวาน มัน เค็ม เป็นเรื่องยุ่งยาก	2.29	1.13	.56	.60	
Nu 11	ฉันต้องกินอาหารกับคนอื่นในบ้าน จะเลือกแต่อาหารที่เหมาะกับตัวเองคงยาก	2.57	1.12	.47	.64	
Nu 13	ฉันคงไม่มีความสุข ถ้าหลังผ่าตัดต้องกินแต่อาหารที่มีประโยชน์ งดหวาน มัน เค็ม	2.40	1.27	.41	.67	
Preparation						.65
Nu 2	ฉันตั้งใจแน่วแน่ ว่าจะกินอาหารอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ภายใน 1 เดือนข้างหน้า	4.19	.91	.40	.63	
Nu 7	ฉันตั้งใจฟังเวลาพยาบาลสอนและอ่านเอกสารเรื่องอาหารหลังผ่าตัด	4.32	.65	.53	.54	
Nu 10	ฉันซักถามหมอ/พยาบาลเรื่องอาหารที่ฉันต้องกินหลังผ่าตัด	4.12	.79	.42	.60	
Nu 12	ฉันพยายามกินอาหารตามแบบที่ทางโรงพยาบาลจัดให้หลังผ่าตัด	4.20	.79	.42	.60	
Action						.84
Nu 1	ฉันคอยเตือนตัวเองว่าต้องกินอาหารที่มีประโยชน์ งดหวาน มัน เค็ม ให้ได้ทุกวันแบบนี้จนกว่าจะหายดี	4.38	.79	.73	-	
Nu 8	ทุกวันนี้ ฉันกินอาหารที่มีประโยชน์ งดหวาน มัน เค็ม อยู่แล้ว และจะพยายามทำต่อไป	4.28	.75	.73	-	

Table 4 Means, SD, Corrected Item-Total Correlations, Subscale Reliabilities, and Subscale Reliability if Item Deleted of the RTC-CQ (n=533).

Subscale/item		Mean	SD	Corrected item-total correlation	α if item deleted	Subscale's reliability
Precontemplation						.67
Com 2	ถ้าฉันมาพบหมอตามนัด หมอจะดูแลเรื่องแผลผ่าตัดและอาการทั่วไปของฉันอยู่แล้ว ฉันไม่จำเป็นต้องทำอะไร	2.09	1.15	.51	-	
Com 5	ถ้าฉันกลับบ้านได้หลังผ่าตัด แปลว่าฉันปลอดภัยดีแล้ว ไม่น่ามีอาการผิดปกติเกิดขึ้น	2.32	1.22	.51	-	
Contemplation						.71
Com 6	ฉันควรระวังเรื่องแผลติดเชื้อ และสังเกตการเต้นผิดจังหวะของหัวใจหลังผ่าตัด แต่ตอนนี้ฉันยังไม่ได้ทำ	2.89	1.34	.45	.68	
Com 9	ฉันคิดว่ายากเกินไปสำหรับฉันที่ต้องสังเกตแผล วัดไข้ จับชีพจรตัวเอง	2.50	1.15	.55	.62	
Com 10	ฉันไม่มั่นใจว่าหลังผ่าตัด ฉันจะจับชีพจรของตัวเองได้	2.74	1.15	.59	.60	
Com 11	ฉันไม่มั่นใจว่าอาการผิดปกติอย่างไรที่ควรรีบมาพบแพทย์	2.78	1.19	.42	.70	
Preparation						.71
Com 1	ฉันตั้งใจแน่วแน่ว่าจะดูแลแผลผ่าตัด วัดไข้ จับชีพจร และชั่งน้ำหนักตัวเองทุกวัน ภายใน 1 เดือนข้างหน้า	3.94	.87	.32	.78	
Com 3	ฉันตั้งใจฟังเวลาพยาบาลสอนเกี่ยวกับการดูแลแผลผ่าตัด และการสังเกตุอาการผิดปกติหลังผ่าตัด	4.35	.63	.64	.59	
Com 7	ฉันถามหมอ/พยาบาลว่ากลับบ้านแล้ว มีอาการอะไรบ้างที่ฉันต้องรีบมาหาหมอก่อนวันนัด	4.29	.70	.54	.63	
Com 8	ฉันตั้งใจอ่านเอกสารเรื่องการดูแลตัวเองหลังผ่าตัดหัวใจ	4.30	.73	.58	.60	
Action						.76
Com 4	ฉันชั่งน้ำหนักตัว และจับชีพจรทุกวัน และจะพยายามทำให้ได้อย่างนี้ไปตลอด	3.74	.99	.62	-	
Com 12	ฉันคอยระวังอาการผิดปกติหลังผ่าตัดของตัวเองเสมอ และจะพยายามทำให้ได้อย่างนี้ต่อไป	4.11	.91	.62	-	

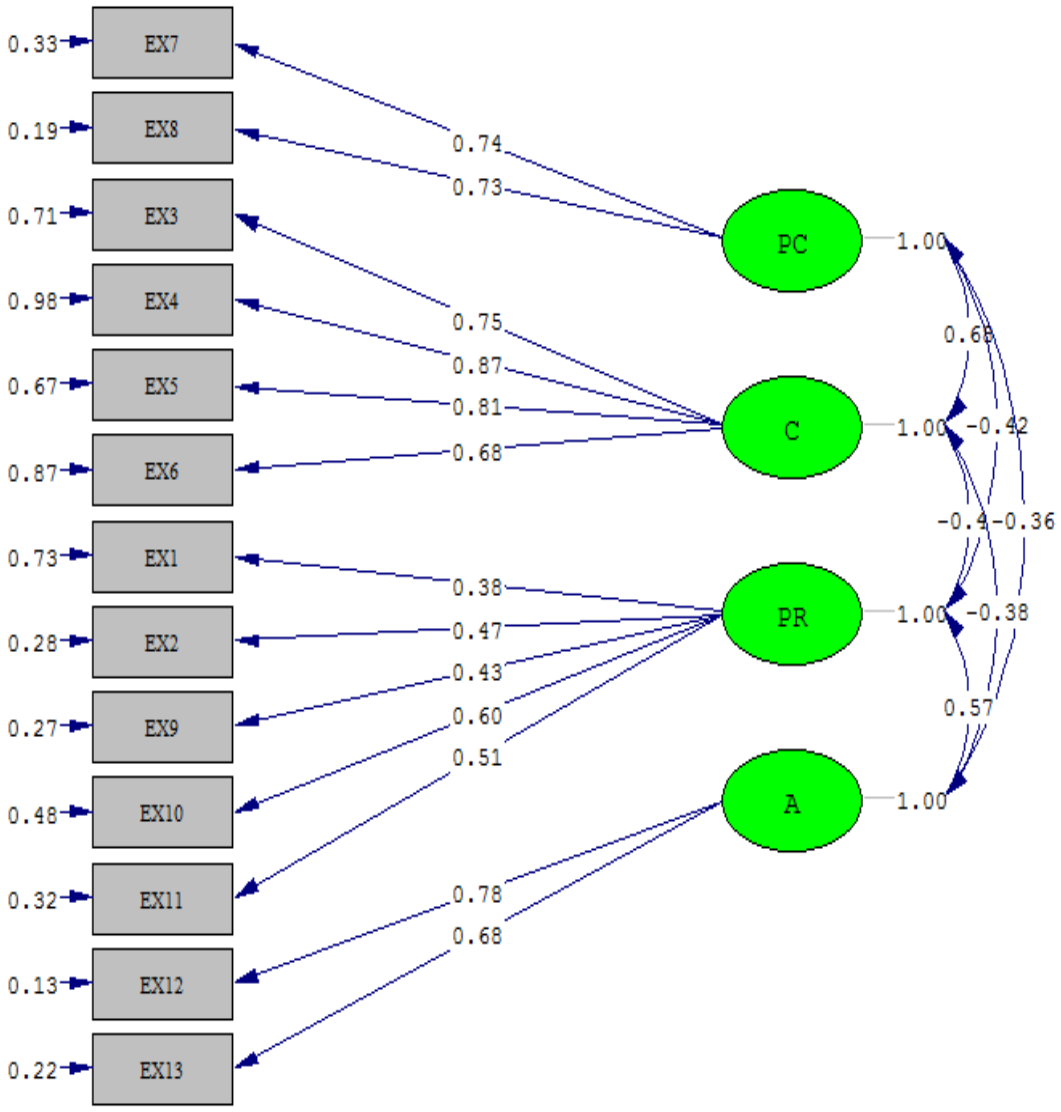
Table 5 Means, SD, Corrected Item-Total Correlations, Subscale Reliabilities, and Reliability if Item Deleted of the RTC-SQ (n=533)

Subscale/item		Mean	SD	Corrected item-total correlation	α if item deleted	Subscale's reliability
Precontemplation						.70
Sym 1	ฉันไม่ได้คิดว่าหลังผ่าตัดฉันต้องคอยจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ	2.33	1.16	.51	.62	
Sym 3	ฉันคิดว่าผ่าตัดแล้วโรคหัวใจจะหายขาด เรื่องอาการปวดแผล ท้องผูก และนอนไม่หลับไม่สำคัญ	2.14	1.14	.56	.56	
Sym 12	ฉันไม่ต้องจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ ฉันก็หายดีหลังผ่าตัดได้	2.26	1.14	.49	.67	
Contemplation						.71
Sym4	ฉันต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัดแต่ตอนนี้ทำได้บ้างไม่ได้บ้าง	3.01	1.17	.57	.57	
Sym 7	ฉันไม่มีเวลาจัดการอาการปวดแผล ท้องผูก นอนไม่หลับหลังผ่าตัดเท่าไร	2.28	1.09	.52	.63	
Sym 13	ฉันไม่มั่นใจว่าจะจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับหลังผ่าตัดได้ดีแค่ไหน	2.94	1.05	.50	.66	
Preparation						.73
Sym 2	ฉันตั้งใจแน่วแน่ว่าจะจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับของ ฉันเอง ภายใน 1 เดือนข้างหน้า	4.02	.90	.42	.74	
Sym 5	ฉันตั้งใจฟังเวลาพยาบาลสอนเรื่องอาการปวดแผล ท้องผูก และนอนไม่หลับหลังผ่าตัด	4.29	.60	.61	.63	
Sym 8	ฉันถามหมอ/พยาบาลว่าต้องจัดการอาการปวดแผล ท้องผูก นอนไม่หลับอย่างไร	4.11	.78	.50	67	
Sym 9	ฉันตั้งใจอ่านเอกสารเรื่องการจัดการอาการปวดแผล ท้องผูก และนอนไม่หลับ	4.18	.70	.60	.62	
Action						.68
Sym 6	ฉันมีวิธีที่ทำให้ฉันนอนหลับตอนกลางคืนได้ดีมาตลอด	3.55	.98	.43	.64	
Sym 10	ฉันกินยาระบายเมื่อจำเป็นและกินผัก ผลไม้เพื่อช่วยการขับถ่ายมานานกว่า 1 เดือนแล้ว	3.82	1.11	.56	.55	
Sym 11	ฉันกินยาแก้ปวดก่อนการทำกิจกรรมที่อาจทำให้ปวดแผลผ่าตัดทุกครั้งและจะไม่อยู่ในท่าที่ทำให้แผลตึงจนปวด	3.68	1.14	.51	.59	
Sym 14	ตอนนี้ฉันกินยาและมีวิธีที่ใช้จัดการเรื่องปวดแผลท้องผูก นอนไม่หลับได้ดี และจะพยายามทำต่อไป	4.04	.89	.40	.67	



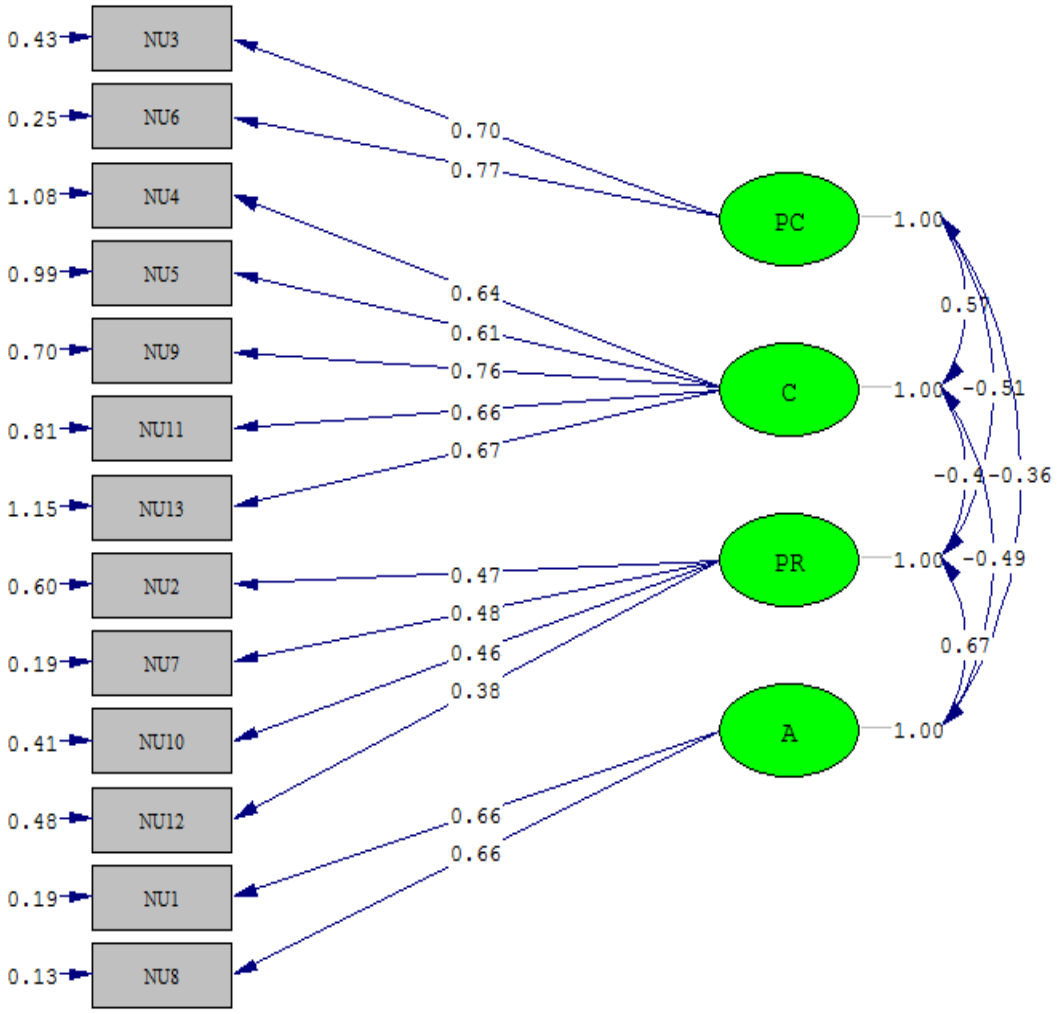
χ^2 = 114.13, df = 29, p = .000; χ^2/df = 3.9; CFI=.96; GFI = 0.96; AGFI=.92; RMSEA = 0.07

Hypothesized model of the RTC-MQ



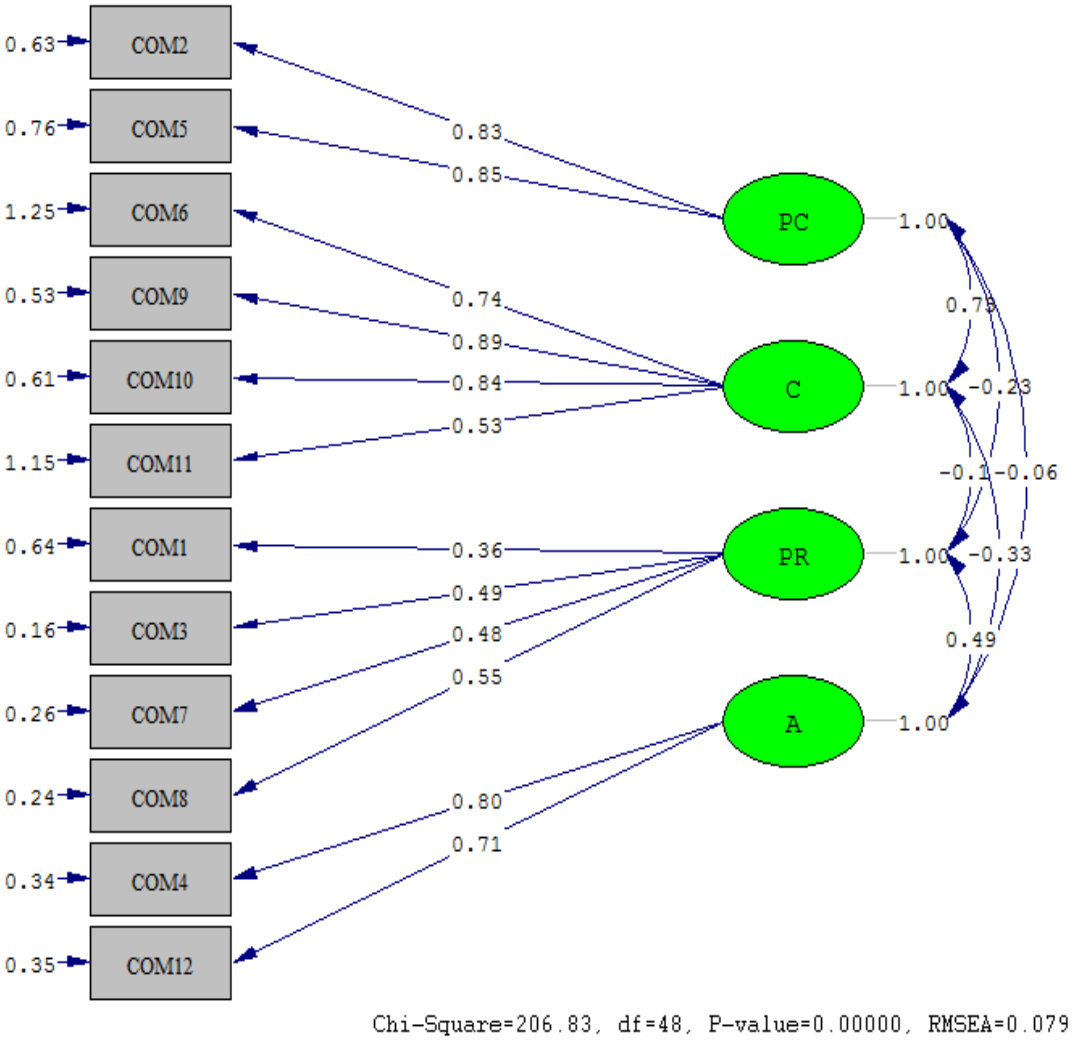
χ^2 = 155.31, df = 59, p = .000; χ^2/df = 2.63; CFI=.97; GFI = 0.96; AGFI=.93; RMSEA = 0.05

Hypothesized model of the RTC-EQ



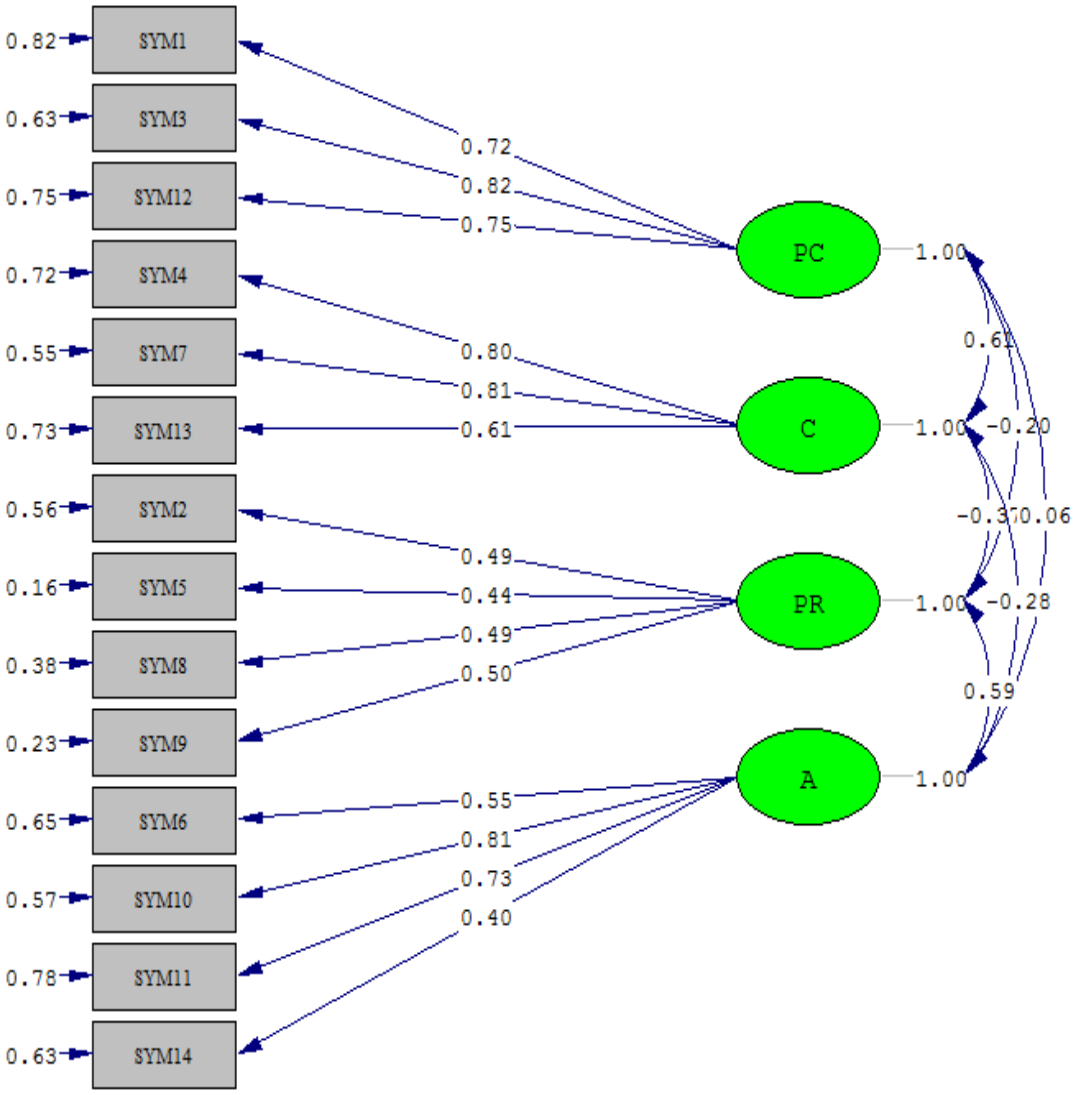
χ^2 = 206.11, df = 59, p = .000; χ^2/df = 3.49; CFI=.97; GFI = 0.94; AGFI=.91; RMSEA = 0.07

Hypothesized model of the RTC-NQ



$\chi^2 = 207.27$, df = 48, p = .000; χ^2/df = 4.32; CFI=.94; GFI = 0.94; AGFI=.90; RMSEA = 0.08

Hypothesized model of the RTC-CQ



χ^2 = 315.55, df = 71, p = .000; χ^2/df = 4.44; CFI=.91; GFI = 0.92; AGFI=.88; RMSEA = 0.08

Hypothesized model of the RTC-SQ

Appendix F

Inform Consent Form and Information Sheet

หนังสือแสดงความยินยอมเข้าร่วมการวิจัย
การวิจัยเรื่อง “การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ”

วันที่.....เดือน.....พ.ศ. .....

ข้าพเจ้า นาย/นาง/นางสาว.....

ที่อยู่.....ได้อ่านรายละเอียดจากเอกสารข้อมูลสำหรับผู้เข้าร่วมโครงการวิจัย ซึ่งมีนางสาวภัทรพร เขียวหวาน นิสิตปริญญาเอก คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เป็นผู้วิจัยหลัก และข้าพเจ้ายินยอมเข้าร่วมโครงการวิจัยโดยสมัครใจ

ข้าพเจ้า ได้รับทราบรายละเอียดเกี่ยวกับที่มาและวัตถุประสงค์ในการทำวิจัย รายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติ ความเสี่ยง/อันตราย และประโยชน์ซึ่งจะเกิดขึ้นจากการวิจัยเรื่องนี้ โดยได้อ่านรายละเอียดในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด และข้าพเจ้ามีเวลาและโอกาสเพียงพอในการซักถามข้อสงสัยจนมีความเข้าใจอย่างดีแล้ว ข้าพเจ้าจึงสมัครใจเข้าร่วมในโครงการวิจัยนี้ โดยข้าพเจ้ายินยอมตอบแบบสอบถามประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจซึ่งใช้เวลาประมาณ 20 – 25 นาที ในครั้งแรก และตอบแบบสอบถามจำนวน 5 ข้อ อีกครั้งหนึ่ง เมื่อเวลาผ่านไป 30 นาที

ข้าพเจ้ามีสิทธิถอนตัวออกจากการวิจัยเมื่อใดก็ได้ตามความประสงค์ โดยไม่ต้องแจ้งเหตุผล ซึ่งการถอนตัวออกจากการวิจัยนั้น จะไม่มีผลกระทบในทางใดๆต่อข้าพเจ้าทั้งสิ้น ข้าพเจ้าได้รับคำรับรองว่า ผู้วิจัยจะปฏิบัติต่อข้าพเจ้าตามข้อมูลที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และข้อมูลใดๆที่เกี่ยวข้องกับข้าพเจ้า ผู้วิจัยจะเก็บรักษาเป็นความลับ โดยจะนำเสนอข้อมูลการวิจัยเป็นภาพรวมเท่านั้น ไม่มีข้อมูลใดในการรายงานที่จะนำไปสู่การระบุตัวข้าพเจ้า

สุดท้ายนี้ ข้าพเจ้ายินดีให้ข้อมูลของข้าพเจ้าแก่ผู้วิจัย เพื่อเป็นประโยชน์ในการศึกษาวิจัยครั้งนี้ ข้าพเจ้ายินดีเข้าร่วมการศึกษานี้ ภายใต้เงื่อนไขที่ได้ระบุไว้แล้วในข้างต้น

……..ลงนามผู้ยินยอม

(……..…..)

วันที่.....

ข้าพเจ้าได้อธิบายวัตถุประสงค์ของการวิจัย วิธีการวิจัย ความเสี่ยงที่อาจเกิดขึ้น รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียดให้กับผู้เข้าร่วมวิจัยตามนามข้างต้นได้รับทราบและมีความเข้าใจดีแล้ว พร้อมลงนามในเอกสารแสดงความยินยอมด้วยความเต็มใจ

……..ลงนามผู้ทำวิจัย

(……..…..)

วันที่.....

……..ลงนามพยาน

(……..…..)

วันที่.....

ข้อมูลสำหรับผู้มีส่วนร่วมในการวิจัย

ชื่อโครงการวิจัย การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ

ชื่อผู้วิจัย นางสาวภัทรพร เขียวหวาน

ตำแหน่ง นิสิตปริญญาเอก คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

สถานที่ติดต่อผู้วิจัย คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย อาคารบรมราชชนนีศรีศตพรรษ ชั้น 11 ถนนพระราม 1 เขตปทุมวัน กรุงเทพฯ 10330

โทรศัพท์ 081-9943008 E-mail: p_kheawwan@yahoo.com

ขอเรียนเชิญท่านเข้าร่วมในการวิจัยเนื่องจากท่านเป็นผู้ป่วยที่อยู่ในระหว่างรอการผ่าตัดหัวใจ หรือท่านเป็นผู้ป่วยที่ได้รับการผ่าตัดหัวใจมาแล้วไม่เกิน 3 เดือน ก่อนที่ท่านจะตัดสินใจเข้าร่วมในการวิจัย มีความจำเป็นที่ท่านควรทำความเข้าใจว่างานวิจัยนี้ทำเพราะเหตุใด และเกี่ยวข้องกับอะไร กรุณาใช้เวลาในการอ่านข้อมูลต่อไปนี้อย่างละเอียดรอบคอบ และสอบถามข้อมูลเพิ่มเติมหรือข้อมูลที่ไม่ชัดเจนได้ตลอดเวลา

1. โครงการวิจัยนี้เป็นงานวิจัยที่ทำขึ้นเพื่อสร้างเครื่องมือวัดความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพของผู้ป่วยหลังผ่าตัดหัวใจ เครื่องมือที่จะสร้างขึ้นนี้มีคุณประโยชน์ในการใช้วัดความพร้อมของผู้ป่วยแต่ละคนในการปฏิบัติตนหลังผ่าตัดที่มีความจำเป็นอย่างยิ่งในการดูแลตนเองเพื่อป้องกันภาวะแทรกซ้อนอันอาจเกิดขึ้นได้เมื่อกลับไปบ้าน ภาวะแทรกซ้อนเหล่านี้เป็นสิ่งที่ป้องกันได้ และรู้ได้แต่เนิ่นๆโดยผู้ป่วยเอง เพียงแต่ผู้ป่วยจะต้องมีความพร้อมในการปฏิบัติกิจกรรมเหล่านี้ที่บ้าน นอกจากนี้การปฏิบัติตนหลังผ่าตัดที่ดีและต่อเนื่องจะทำให้ร่างกายกลับฟื้นสภาพได้ตามปกติในเวลาที่สมควร เครื่องมือวัดความพร้อมของผู้ป่วยที่จะสร้างขึ้นนี้ เป็นสิ่งสำคัญที่พยาบาลจะนำไปใช้ในการประเมินผู้ป่วยทุกท่านเพื่อให้การพยาบาลตามวิธีที่เหมาะสมกับผู้ป่วยแต่ละคน

2. วัตถุประสงค์ของการวิจัย เพื่อสร้างเครื่องมือวัดความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจของผู้ป่วยหลังผ่าตัดหัวใจ

3. ผู้ป่วยที่จะเข้าร่วมงานวิจัยครั้งนี้เป็นผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคหัวใจและอยู่ในระยะของการรอเข้ารับการผ่าตัดหัวใจ หรืออาจเป็นผู้ป่วยที่ได้รับการผ่าตัดหัวใจแบบเปิดมาแล้วไม่เกิน 3 เดือน ซึ่งอายุไม่ต่ำกว่า 18 ปี พูด สื่อสาร และอ่านภาษาไทยเข้าใจ รวมทั้งเต็มใจเข้าร่วมในโครงการวิจัย จำนวนผู้ป่วยที่คาดว่าจะเข้าร่วมวิจัยมี 650 คน โดยขอความร่วมมือจากผู้ป่วยที่เข้ารับการผ่าตัดหัวใจจาก 7 โรงพยาบาลทั่วประเทศไทย (ภาคเหนือ 1 โรงพยาบาล ภาคกลางและกรุงเทพฯ 3 โรงพยาบาล ภาคตะวันออกเฉียงเหนือ 2 โรงพยาบาล ภาคใต้ 1 โรงพยาบาล) จำนวนผู้ป่วยจากโรงพยาบาลจุฬาลงกรณ์ประมาณ 230 คน โดยแบ่งเป็น การศึกษานำร่อง 150 คน และการเก็บข้อมูล

จริง 80 คน สถานที่ที่จะขอเข้าพบผู้ป่วยคือ แผนกผู้ป่วยนอก และหอผู้ป่วยศัลยกรรมหัวใจในของโรงพยาบาลต่างๆที่จะทำการเก็บข้อมูล

4. ผู้ป่วยที่สมัครใจเข้าร่วมในโครงการวิจัยนี้ จะได้รับแบบสอบถามที่สร้างขึ้น และตอบแบบสอบถามตามความเป็นจริงของตนเอง เพียงคนละ 2 ครั้ง โดย

ครั้งที่ 1 ตอบแบบสอบถาม 3 ชุด

ชุดที่ 1 มี 5 ตอน (ตอนที่หนึ่ง 28 ข้อ, ตอนที่สอง 22 ข้อ, ตอนที่สาม 22 ข้อ, ตอนที่สี่ 27 ข้อ และ ตอนที่ห้า 21 ข้อ)

ชุดที่ 2 มี 5 ข้อ

ชุดที่ 3 มี 13 ข้อ

ครั้งที่ 2 ตอบแบบสอบถาม 1 ชุด จำนวน 5 ข้อ หลังจากตอบแบบสอบถามครั้งแรกแล้ว ประมาณ 30 นาที

ประโยชน์ที่คาดว่าจะเกิดขึ้นของงานวิจัยนี้ อาจจะไม่เกิดขึ้นโดยตรงต่อตัวท่าน แต่ผลการวิจัยจะเป็นข้อมูลสำคัญที่สามารถนำไปใช้ในการพัฒนาเครื่องมือวัดความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพของผู้ป่วยผ่าตัดหัวใจ และยังมีประโยชน์ในการวิจัยเพื่อพัฒนาการพยาบาลที่เหมาะสมกับผู้ป่วยกลุ่มนี้ต่อไป

5. ผู้วิจัยทราบดีว่าอาจมีความเสี่ยงเกี่ยวกับความลับของท่านอาจถูกเปิดเผย ผู้วิจัยจึงดำเนินการป้องกันโดยใช้เลขรหัสแทนชื่อของท่าน ไม่มีการบันทึกชื่อ ที่อยู่ หรือข้อมูลใดๆที่สามารถระบุถึงตัวของท่านได้ ผลการวิจัยจะถูกเสนอในภาพรวม ยกเว้นจะได้รับคำยินยอมจากท่านโดยระเบียบและกฎหมายที่เกี่ยวข้องเท่านั้น

6. การขอความร่วมมือตอบแบบสอบถามจะกระทำเมื่อท่านพร้อม หากท่านเป็นผู้ป่วยที่แผนกผู้ป่วยนอก ท่านจะได้รับการขอความร่วมมือให้ตอบแบบสอบถามขณะนั่งรอพบแพทย์ หากท่านพักรักษาตัวในหอผู้ป่วยศัลยกรรมหัวใจ ท่านจะได้รับการขอความร่วมมือให้ตอบแบบสอบถามที่เตียงของท่าน ขณะที่ไม่มีกิจกรรมทางการพยาบาลหรือการแพทย์ และสภาพร่างกายของท่านมีความพร้อม

หากท่านไม่สะดวกในการเข้าร่วมวิจัย ไม่ว่าจะเป็นก่อนหรือหลังการได้รับข้อมูล หรือตกลงกับผู้วิจัย/ผู้ช่วยวิจัยแล้ว ท่านสามารถปฏิเสธการเข้าร่วมวิจัย หรือสามารถถอนตัวจากการวิจัยได้ตลอดเวลา โดยการปฏิเสธครั้งนี้จะไม่ส่งผลต่อกระบวนการรักษาพยาบาลแต่อย่างใด และในระหว่างการตอบแบบสอบถาม ท่านมีสิทธิที่จะไม่ตอบคำถามข้อใดข้อหนึ่งที่ไม่ต้องการตอบได้

ท่านสามารถติดต่อกับผู้วิจัยในกรณีที่ต้องการสอบถามข้อมูล หรือมีปัญหาต่างๆ ได้ตลอด 24 ชั่วโมง โดยทำการติดต่อมาที่ นางสาวภัทรพร เขียวหวาน โทรศัพท์ 081-9943008 และทาง E-mail: p_kheawwan@yahoo.com

หมายเหตุ หากท่านไม่ได้รับการปฏิบัติตามข้อมูลดังกล่าวสามารถร้องเรียนได้ที่ คณะกรรมการพิจารณาจริยธรรมการวิจัย คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

หมายเลขโทรศัพท์ 02 256-4455 , 02 256-4493 ต่อ 14 หรือ 15 โทรสาร 02 256-4455 , 02 256-4493 ต่อ 17

Appendix G

IRB Approval Forms

COA No. 240/2012
IRB No. 084/55

INSTITUTIONAL REVIEW BOARD
Faculty of Medicine, Chulalongkorn University
1873 Rama 4 Road, Patumwan, Bangkok 10330, Thailand, Tel 662-256-4455 ext 14, 15

Certificate of Approval

The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, has approved the following study which is to be carried out in compliance with the International guidelines for human research protection as Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Study Title : The Development of the Readiness to Change Cardiac Health Behaviors Scale

Study Code : -

Study Center : Faculty of Nursing, Chulalongkorn University

Principal Investigator : Miss Pataraporn Kheawwan

Review Method : Expedited

Continuing Report : At least once annually or submit the final report if finished.

Document Reviewed :

1. Protocol Version 2, 13/3/2012
2. Protocol Synopsis Version 2, 13/3/2012
3. Informed Consent Form
4. Information sheet for research participant Version 2, 13/3/2012
5. Case Record Form
6. The first questionnaire (for participants)
7. The second questionnaire (for participants).

Signature: ..... **Signature:** .....

(Emeritus Professor Tada Sueblinvong MD)
Chairperson
The Institutional Review Board

(Associate Professor Supeecha Wittayalertpanya)
Member and Assistant Secretary, Acting
Secretary The Institutional Review Board

Date of Approval : April 5, 2012

Approval Expire Date : April 4, 2013

Approval granted is subject to the following conditions: (see back of this Certificate)

เอกสารรับรองโครงการวิจัยที่เกี่ยวกับการวิจัยในคน
โรงพยาบาลราชวิถี

รหัสโครงการวิจัยที่ 55047
เอกสารเลขที่ 037 /2555

ชื่อโครงการ "การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ"

(ภาษาอังกฤษ) "The Development of the Readiness to Change Cardiac Health Behaviors Scale."

ชื่อหัวหน้าโครงการ นางสาวภัทรพร เขียวหวาน

ตำแหน่ง นิสิตปริญญาดุษฎีบัณฑิต

สังกัดหน่วยงาน คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

เอกสารรับรอง

1. โครงร่างการวิจัย ฉบับที่ 1 ลงวันที่ 24 กุมภาพันธ์ 2555
2. เอกสารข้อมูลคำอธิบายสำหรับผู้เข้าร่วมในโครงการวิจัย ฉบับที่ 1 ลงวันที่ 15 มีนาคม 2555
3. เอกสารแสดงความยินยอมเข้าร่วมในโครงการวิจัย ฉบับที่ 1 ลงวันที่ 15 มีนาคม 2555
4. แบบสอบถาม ฉบับที่ 1 ลงวันที่ 24 กุมภาพันธ์ 2555

โครงการวิจัยได้ผ่านการพิจารณาและรับรองโดยคณะกรรมการวิจัยและจริยธรรมการวิจัย โรงพยาบาลราชวิถี เมื่อวันที่ 15 เดือน มีนาคม พ.ศ. 2555 และจะรับรองโครงการวิจัยเป็นระยะเวลา 2 ปี คือสิ้นสุดวันที่ 14 เดือน มีนาคม พ.ศ. 2557

ลงนาม.....
(รศ.คลินิก นพ.อุดม ไกรฤทธิชัย)
ประธานคณะกรรมการวิจัยและจริยธรรมการวิจัย

ลงนาม.....
(รศ.คลินิก พญ.วารณี จินารัตน์)
ผู้อำนวยการโรงพยาบาลราชวิถี

ทั้งนี้ การรับรองนี้มีเงื่อนไขดังที่ระบุไว้ด้านหลังทุกข้อ (ดูด้านหลังของเอกสารรับรองโครงการวิจัย)

เลขที่ 053/2555

คณะกรรมการจริยธรรมเพื่อการวิจัยสถาบันโรคทรวงอก
กรมการแพทย์
กระทรวงสาธารณสุข

โครงการวิจัย : "การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ"

ผู้ดำเนินการวิจัย : นางสาวภัทรพร เขียวหวาน นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

สถานที่ทำการวิจัย : สถาบันโรคทรวงอก

เอกสารที่ได้รับการพิจารณามีดังนี้

1. บันทึกข้อความขอเสนอพิจารณาอนุมัติทางจริยธรรมเพื่อการวิจัย สถาบันโรคทรวงอก
2. โครงร่างวิจัยฉบับสมบูรณ์
3. เอกสารข้อมูลสำหรับผู้เข้าร่วมโครงการวิจัย
4. แบบฟอร์มใบยินยอมเข้าร่วมวิจัย
5. แบบสอบถาม

คณะกรรมการจริยธรรมเพื่อการวิจัยสถาบันโรคทรวงอก กรมการแพทย์ กระทรวงสาธารณสุข อนุมัติในแง่จริยธรรมให้ดำเนินการศึกษาวิจัยเรื่องข้างต้นได้

..... ประธานกรรมการ
(นายแพทย์ชูศักดิ์ เกษมศานต์)

..... เลขานุการกรรมการ
(นายแพทย์เฉลียว พูลศิริปัญญา)

รับรองวันที่ : 21 มี.ค. 2555
วันหมดอายุ : 21 มี.ค. 2556

No. 160/2012

Certificate of Approval

Name of Ethics Committee : Research Ethics Committee 3, Faculty of Medicine, Chiang Mai University **Address of Ethics Committee :** 110 Intavaroros Rd., Amphoe Muang, Chiang Mai, Thailand 50200
Principal Investigator: Pataraporn Kheawwan. Research Institute of Neurology. Institute of Neurology, Department of Health, Ministry of Health.
Protocol title: The Development of the Readiness to Change Cardiac Health Behaviors Scale. **STUDY CODE:** NON CMU-12-954-EX/ Research ID : 954 **Sponsor:** Faculty of Nursing, Chulalongkorn University.

Documents filed	Document reference
Research protocol	Version 2.0 (Amendment #1) date 29 April 2012
Patient information sheet/ Informed consent documents	Version 2.0 (Amendment #1) date 29 April 2012
Questionnaire No.1	Version 2.0 (Amendment #1) date 29 April 2012
Questionnaire No.2	Version 2.0 (Amendment #1) date 29 April 2012
Principal Investigator Curriculum vitae	Version date 12 June 2012

DECISION : [✓] By expedited review

[ ] By full committee meeting .....Date : .....

Opinion of the Ethics Committee/Institutional Review Board : PLS. CHECK ONE
✓ Approval

_____Conditional approval (Specify on space below)

.....

Progress report submit every ☐ 3 months ☐ 6 months
☑ 1 year ☐ Other.....

Date of Approval: ...12... June 2012 **Expiration Date:** ...11... December 2013

This Ethics Committee is organized and operates according to GCPs and relevant international ethical guidelines, the applicable laws and regulations.

Signed : .....P. Kulapongs.....

(Emeritus Professor Panja Kulapongs, M.D.)

Chairperson, Faculty of Medicine

GENERAL CONDITION OF APPROVAL:

- Please refer to www.med.cmu.ac.th/research/ethics/inv_sop_announce.pdf article 13.
- Please submit the progress report at least once a year except where required more frequent by the REC.
- In particular, approval of this study must be renewed at least three months before the expiration date if work is to continue.
- Prior Research Ethics Committee approval is required before implementing any changes in the consent documents or protocol unless those changes are required urgently for the safely of subjects.
- Any event or new information that may affect the benefit/risk ratio of the study must be reported to the REC promptly
- Any protocol deviation/violation must be reported to the REC

KHON KAEN UNIVERSITY

This is to certify that

The Project Entitled: THE DEVELOPMENT OF THE READINESS TO CHANGE CARDIAC HEALTH BEHAVIORS SCALE

Principle Investigator: 1. Miss PATARAPORN KHEAWWAN
Faculty of Nursing, Chulalongkorn University
2. Miss SUTICHA SUWANNASRI
Nursing service of Srinagarind hospital
3. Miss MONTIRAWAN PIMSRI
Nursing service of Srinagarind hospital

Documents Acceptance:

1. KKUEC Application form , version 1.1, dated 16 May 2012
2. Social and Health Science Protocol, version 1.1, dated 16 May 2012
3. Information sheet, version 1.1, dated 16 May 2012
4. Informed Consent Form, version 1.6, dated 16 May 2012
5. Case Report Form, version 1.0, dated 2 February 2012
6. Investigator's Curriculum Vitae

Have been reviewed by the Khon Kaen University Ethics Committee for Human Research based on the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines. Please submit the progress report every 12 months

Date of Approval: 1 June 2012
Date of Expire: 17 April 2013

(Associate Professor Suchat Areemit, M.D.)
Chairman of The Khon Kaen University Ethics Committee for Human Research, Panel 1

Record No. 4.3.01: 16/2555
Reference No. HE551109

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Tel. & +66-43-366606 ,+66-43-366602 Fax:+66-43-366617

Institutional Review Board Number; IRB00001189
Federal Wide Assurance; FWA00003418

รหัสเอกสารรับรอง 014/2555

เอกสารรับรองจริยธรรมโครงการวิจัยในมนุษย์

คณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลสรรพสิทธิประสงค์ อุบลราชธานี

ชื่อโครงการ การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ

EFFECT OF A NURSING PROGRAM FOR STRESS REDUCING ON STRESS LEVELS OF MOTHERS HAVING NEWBORN WITH PHOTOTHERAPY

ผู้วิจัยหลัก นางสาวภัทรพร เขียวหวาน

หน่วยงาน/สถาบัน คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

คณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลสรรพสิทธิประสงค์ อุบลราชธานี ได้พิจารณารายละเอียดของโครงร่างการวิจัย เอกสารข้อมูลสำหรับอาสาสมัคร เอกสารแสดงความยินยอมเข้าร่วมการวิจัยภาษาไทยแล้ว มีมติสมควรให้ดำเนินการวิจัยในขอบเขตของโครงการที่เสนอได้

(นพ.จิรวัฒน์ มูลศาสตร์)
ประธานคณะกรรมการการวิจัยในมนุษย์

(นายแพทย์มนัส กนกศิลป์)
ผู้อำนวยการโรงพยาบาลสรรพสิทธิประสงค์

วันที่รับรอง : 03 ก.ค. 2555 **วันหมดอายุของการรับรอง:** 02 ก.ค. 2556

เอกสารที่รับรองรวมถึง

1. โครงร่างการวิจัย
2. ใบยินยอมและเอกสารชี้แจงอาสาสมัคร
3. ผู้วิจัย/คณะผู้วิจัย
4. แบบสอบถาม/แบบบันทึกข้อมูล

ผู้วิจัยที่ได้รับการรับรองต้องยอมตามเงื่อนไขดังต่อไปนี้

1.ผู้วิจัยรับทราบว่าเป็นการผิดจริยธรรมที่จะรวบรวมข้อมูลที่ศึกษาก่อนโครงการได้รับการรับรองโดยคณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลสรรพสิทธิประสงค์ อุบลราชธานี

2.กิจกรรมของโครงการวิจัยต้องจบลงภายในวันหมดอายุของการรับรอง ถ้าต้องการขยายเวลา ต้องยื่นแสดงความจำนงก่อนวันหมดอายุ 30 วัน

3.ผู้วิจัยต้องทำการศึกษาตรงตามที่ระบุไว้ในโครงร่างงานวิจัยอย่างเคร่งครัด

4.ใช้เพียงแบบฟอร์มที่คณะกรรมการจริยธรรมฯได้รับรอง (ใบยินยอมและเอกสารชี้แจงอาสาสมัคร, แผ่นประชาสัมพันธ์ เป็นต้น) และ คณะกรรมการจริยธรรมฯมีสิทธิตรวจสอบเอกสารดังกล่าวได้ทุกครั้งเมื่อต้องการ

5.ในกรณีที่เกิดเหตุการณ์ข้างเคียงร้ายแรง ต้องรายงานคณะกรรมการจริยธรรมฯภายใน 5 วันทำการ

6.ในกรณีที่มีการเปลี่ยนแปลงกิจกรรมไปจากเดิมที่รับรองไว้ ต้องรายงานคณะกรรมการจริยธรรมฯ ก่อนที่จะเริ่มทำกิจกรรมนั้นๆ

7.ส่งรายงานการวิจัยฉบับสมบูรณ์หลังโครงการวิจัยเสร็จสิ้นลงแล้ว จำนวน 1 ฉบับ

EC: 55-171-19-6-3

คณะแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์
ตำบลคอหงส์ อำเภอหาดใหญ่
จังหวัดสงขลา 90110

หนังสือรับรองนี้ให้ไว้เพื่อแสดงว่า

โครงการวิจัยเรื่อง	:	**การพัฒนาเครื่องมือประเมินความพร้อมในการเปลี่ยนพฤติกรรมสุขภาพหัวใจ** (The Development of the Readiness to Change Cardiac Health Behaviors Scale)
หัวหน้าโครงการ	:	**นางสาวภัทรพร เขียวหวาน**
ภาควิชา/คณะ	:	คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ได้ผ่านการพิจารณาและได้รับความเห็นชอบจากคณะกรรมการอนุกรรมการจริยธรรมด้านวิจัยเกี่ยวกับบริบาลผู้ป่วย สิ่งส่งตรวจ และสังคมศาสตร์ ของคณะแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์ แล้ว

ให้ไว้ ณ วันที่ 2 เมษายน 2555

.....ประธานอนุกรรมการ
(รองศาสตราจารย์นายแพทย์วีระพล จันทร์ดียิ่ง)
รองคณบดีฝ่ายวิจัย

Biography

Name	Ms Pataraporn Kheawwan
Date of Birth	20 June 1970
Position	Advanced Practice Nurse
Working Institute	CVTICU, King Chulalongkorn Memmorial Hospital Bangkok, Thailand
Telephone	022565205
Email address	P_kheawwan@yahoo.com

Educational Background

1991	Bachelor if Nursing (B.N.)	The Thai Red Cross College of Nursing
1998	Master of Science(M.Sc.)	Faculty of Medicine, Mahidol University
2004	Master of Nursing Science (M.N.S.)	Faculty of Nursing, Chulalongkorn University