

CHAPTER 2

LITERATURE REVIEW

A literature review was carried out in order to gain greater understanding in developing the Primary Care Competency Assessment Scale (PC-CAS) for primary care (PC) providers in Thailand. The approach used for the literature review included an electronic search of several databases, such as CINAHL, Proquest, Medline, PubMed, Ovid, NONPF, AACN, CCNE, AFPNP, ACNP, and Nursing World. Furthermore, a hand search of English and Thai articles was performed. Altogether, there were four major topics covered in the literature review: (1) philosophical and theoretical foundations, (2) concept of competency, (3) primary care, and (4) instrument development.

Philosophical and theoretical foundations

The philosophical and theoretical foundations of competency consisted of adult learning theory and Benner's model, and role theory.

Adult learning theory and Benner's model

Adult learning theory is essential in maintaining and increasing competency in professional practice. The development of practitioners' skill was analyzed; a model based on Dreyfus's work which was combining adult learning theory was also developed by Benner (Dreyfus, 1981 cited in Benner, 1984; Dreyfus & Dreyfus, 1985).

Characteristics and benefits of adult learning promote the increase in competency of the learners. The adult learning theory which was pioneered by Knowles (Lieb, 1991) suggests that generally adults need to learn by self-directed learning activities in daily life. The learner needs to develop capacity, enhance ability, and participate in emancipatory learning and social action (Merriam, 2001). Activities and experiences that occur repeatedly and in repeated situations will result in the learner developing greater competency in those situations. Adult learning is different from classroom learning in that adult learners can learn at any time and in any place if they are intent upon learning. Thus, the characteristics of an effective adult learner is one who is independent, able to direct his/her own learning, having accumulated life experience rich in resources of learning, having learning needs related to a changing society, problem-centered with the interest in the application of knowledge, and motivated to learn more by internal than external factors. Internal factors are considered to be such factors as self-directed interests and psychological needs whereas external factors are physiological needs, healthcare policy, quality control, standards of PCU, and PCU's goals.

A model of practical competency development for health practitioners is Benner's model (Benner, 1984). This model can explain from the beginning of PC providers' work life to their learning processes which are acquired through experience and formal training. Initially, novice professionals rely on formal rules, policies, and procedures as guides to their practice. As their practitioner expertise develops, they will be able to look beyond the procedures and use intuition and reflection to clarify dimensions of a problem in order to achieve the best practice. There are five stages of competency development in Benner's model, i.e., novice, advanced beginner,

competent, proficient, and expert. Benner's model suggests that the duration of working time correlates with the practitioner competency. Competency is the outcome of learning, development, and experience (Kelly-Thomas, 1998). A practitioner who is competent in one setting may be incompetent in another based on that context (Waddell, 2001). Thus, competent professional practice is experience-based and context-specific.

The adult learning theory is a theoretical foundation for understanding competency development of PC providers in this study. Generally, PC providers are viewed as adults who have autonomy and are self-directed in providing primary care to the clients of PCU's. In developing the Primary Care Competency Assessment Scale (PC-CAS), the investigator is concerned with those factors which influence the PC providers' competency. Thus, the evaluation of psychometric properties uses the test-retest method in order to determine its stability. Competency has low temporal stability in that state measures can change over time. Nevertheless, it can maintain stability for certain periods of time. Temporal stability is achieved with a high correlation between scores over repeated testing. The interval of test-retest should be ideally two weeks in order to assess the measurement error due to possible temporal instability (Nunnally and Bernstein, 1994). In addition, construct validity of the PC-CAS was tested by using the hypothesis testing approach. The hypotheses derived from Benner's model were used in the testing approach as stated, "the mean of the competency score of full-time PC providers would be higher than the mean of the competency score of part-time PC providers" and "the duration of experience in primary care, PCU employment, and education would have a positive correlation with the PC providers' competency scores."

Competency is a constant state remaining stable for some degree. Learning, training, and acquired experience are influenced to change competency. Benner's model was proved to know that duration of working time in each setting and experience of work are powered on competency. In this study, the PC-CAS was developed to assess the PC providers' competency. According to the characteristics of competency, stability evaluation of the instrument required test-retest within two weeks (Nunnally & Bernstein, 1994). Construct validity was tested through the differences in mean scores of PC-CAS between full-time PC providers and part-time group. It was evaluated by testing the hypotheses based on Benner's model. The duration of experience in primary care, PCU employment, and education was seen to be correlated with the primary care competency of the PC providers. Stability reliability and construct validity of the PC-PAS was evaluated based on competencies' characteristics.

In conclusion, adult learning theory is significant for increasing learners' competencies. This point is essential for developing the PC-CAS for Thai PC providers who are concerned with competency development. Benner's model is the model of practical competency development for health practitioners. Primary care competency of the PC providers can increase if the practitioners train, learn, and repeated practice. According to traits of competency, the PC-CAS was evaluated its stability by using test-retest within two weeks. While testing hypothesis of the Benner' model was used to evaluate its construct validity.

Role theory

Role theory is related to competency of work. Role under status and job descriptions influence on established competency. According to Park and Linton (cited in Biddle & Thomas, 1966), role is the expected behavior of one who holds a particular status. Each person may hold a number of various statuses that he or she is expected to fulfill in his/her appropriate roles. PC providers refer to professional nurses, public health staffs, health officers, midwives, technical nurses, and public health directors who work at PCUs. They have studied and trained in the provision of primary care as well as having been oriented in the role of PC providers. Their job-descriptions guide them to perform their roles within scope of practice reflecting their competency (ANCC, 1997 cited in Waddell, 2001). According to the Thailand Nursing Council, the role of PC providers consists of care provider, manager (leader), facilitator, educator (counselor), change agent, and expert in the community health (Srisuphan, 2004). In addition, the roles of advocator, communicator, and researcher were included (Bureau of nursing-MOPH, 2000). However, there is evidence indicating that PC providers may be somewhat confused in their roles (Konggumnerd, 2003; Pengpara, Jongjirasiri, & Hongsampai, 2003; Pongpipattanapan, 2002). The roles of PC providers should be clarified with regard to their job-descriptions. When PC providers are clear in their roles, they will be able to assert their privileges and act out of their duties. PC providers' roles are analyzed based on their job-descriptions. The job-description's aims focus and guide PC providers to function efficiently and effectively in their assigned roles based on the competency. Therefore, based on the roles of status under job-descriptions, competency of practitioners was established.

In the development of the PC-CAS, the evaluation of construct validity is considered. As the PC-CAS is an instrument particularly designed to assess primary care competency of PC providers. The clarity of roles under status and job-descriptions would be concerned. Thus, Confirmatory Factor Analysis (CFA) was used to test the internal structure of the PC-CAS. If the PC providers' roles were clear in their job-descriptions and in their performance, their responses reflecting primary care competency would confirm the PC-CAS construct. Therefore, the CFA was appropriate to evaluate the construct validity of the PC-CAS. In addition, two groups of full-time PC providers and part-time group were used to test the construct validity. Accordingly, the PC-CAS scores of the full-time group were expected to be higher than those of the part-time group.

Concept of competency

Concept of competency, a complex multidimensional concept, has been clarified. The definition and components of competency are employed by many authors (Giroto, 1993; McMullan et al., 2003; Nagelsmith, 1995; Watson, et al., 2002). Competency is necessary to be integrated into the advanced service and professional education. In nursing competency is defined as ability or capability to perform a task with desirable outcomes (Benner, 1982; McMullan et al., 2003; Nagelsmith, 1995; Watson, et al., 2002; While, 1994). The defining attributes of competency consist of knowledge, ability, skill (using functional problem-solving skills), sense of self-efficacy, trait/attitude, and trust (holding basic assumptions regarding the inherence of expectation and social trust) (Giroto, 1993; Nagelsmith, 1995). Learning, developing, and having an experience are the antecedents of competency (Kelly-Thomas, 1998).

Definitions of competency

Many meanings of competency are defined. According to the Oxford Advanced Learner's dictionary (Hornby, 2000), the term "competency" is a noun that means, "the ability to do something well". Competence is defined as the ability to perform a task with desirable outcomes (Benner, 1982; Nagelsmith, 1995; While, 1994), with effective application of knowledge and skills (DelBueno, 1990), and as something that a person should be able to do (Mansfield & Mitchell, 1996). The English National Board for nursing (1993 cited in Flanagan, Baldwin & Clarke, 2000) defined the term "competency" as the ability to perform particular activities of work, e.g., nursing procedure, health education, and health assessment. It is similar to Ellis and Hartley (2001) who define nursing competence as the ability to perform specified nursing skills that are included in the application of critical thinking skills.

In addition, Benner, Tenner, and Chesla (1996 cited in Waddell, 2001) describe competence differently from other authors. They state that competency is the evolution from novice to expert practitioner. Thus, a competent professional is a practitioner who has increased clinical/practical understanding, technical skill, organizational management ability, and creative thinking ability. Abruzzese (1996) describes a competent professional as one who possesses appropriate knowledge, skills and attitude. Furthermore, Kelly-Thomas (1998) explains the meaning of these three words, *competency*, *competence*, and *competent* as follows: *Competency* is a broad statement describing an aspect of practice that must be developed and demonstrated; *competence* is the achievement and integration of many competencies into practice or the overall ability to perform; *competent* is an adjective used to describe a person who has met all identified roles related to competencies. Santong

(2004) defines competency as the ability of a person to do something and to demonstrate outcomes. In this study, competency refers to the ability to perform primary care provision or a task producing quality of primary care.

Components of competency

Competency consists of various components based on the authors view. Knowledge, skill, and trait/attitude are common components of competency (Jeska, 1998; Kelly-Thomas, 1998). Some authors state that competency has dimensions as administrative skills, i.e., critical thinking, conceptual /organizational, interpersonal skills, and technical skills (Connelly et al., 2003; DelBueno, 1997; Katz, 1974 cited in Connelly et al., 2003). Some authors view competency as having four characteristics, i.e., knowledge, skills, abilities, and traits whereas Spencer and Spencer (1993, cited in Decker, Strader, & Wise, 1997) adds motives and self-concept. Short (1984 cited in McMullan et al., 2003), in contrast, views that competency could be grouped into basic approaches, i.e., behavioral or performance approach, generic approach, and holistic approach. In addition, Santong (2004) proposes that competency be classified into three categories, i.e., core competencies, job/functional competencies, and personal competencies. In this study, competency consists of knowledge, skill, and trait.

Competency assessment

Competency is measured by using a variety of methods, e.g., written tests, computerized tests, performance records, simulation models, job samples, and supervisory performance appraisals (Kak et al., 2001). The advantage of assessing competency is continual improvement in order to eventually achieving the target set

for the quality of task, which is to be implemented by directors on competency-based education, e. g., learning needs, providing insights into areas of professional practice, and allocating educational resources for training which may be identified by the directors. Competency measurement is used to predict job quality, which may increase the opportunity for further professional development. In addition, the needs for remedial action will be identified and implemented for improved job performance of trainees who score low on the end-of-training competency tests.

Different assessment methods have different strengths and weaknesses (Jutsum, 1999). Computerized and written tests are used to assess ability, traits, and knowledge, but are not used to assess skill. Record of performance, unlike other methods, can be conducted without the examinees' awareness and provide important information (Kak et al., 2001). Wolf (1989, cited in McMullan et al., 2003) and Gonczi et al. (1993 cited in McMullan et al., 2003) point out that competency cannot be observed directly, but can only be inferred from performance. Under a performance-based assessment system, the assessors will judge from evidence based on performance whether an individual meets criteria specified in the standards of competency. As a result, a decision concerning the level of performance of each person to be assessed can be determined.

There are many instruments available for measuring healthcare professionals' competency (Evans, Elwyn, & Edwards, 2004; Lockyer, 2003; Waddell, 2001), for example, Professional Associate Rating (Ramsey et al., 1996 cited in Evans, Elwyn, & Edwards, 2004), Peer Assessment Questionnaire (Hall et al., 1999 cited in Evans, Elwyn, & Edwards, 2004), Peer Review Evaluation Form (Thomas et al., 1999 cited in Evans, Elwyn, & Edwards, 2004), the Slater Nursing Competencies Rating Scale

(Wandelt & Stewart, 1975 cited in Waddell, 2001), Quality Patient Care Scale (Wandelt & Ager, 1975 cited in Waddell, 2001), and King's Nurse performance Scale (Fitzpatrick, While, & Roberts, 1997). However, all of them are confined to assessing clinical nursing competency and physicians' competency.

In conclusion, competency can be measured by using a variety of methods. Different assessment methods have different strengths and weaknesses. There are many instruments available for measuring healthcare professionals' competency. Competency which is the outcome of learning, development, and work experience, is important for staff development in many disciplines. When a level of competency is defined in relation to a standard, the profession can state the required performance of those within that profession.

Primary care

Primary care is healthcare provision system which has many definitions based on the authors' views. In 2000, the Thai Ministry of Public Health (MOPH) defined "primary care" as a level of care provided by health personnel, i.e., professional nurses, public health staff, health officers, public health directors, midwives, and technical nurses. Starfield (1992) described two major goals of primary care, i. e., optimization of health and equity in distributing healthcare resources. In the Thai primary care system, four features are emphasized, i.e., first contact care, longitudinal care, comprehensive care, and coordinate care (Health Service Network Development Institute, 2003; Bureau of Nursing, 2003, Srivanitchakorn, 1998; Yengkratok, 2001). According to the MOPH, primary care provisions' conceptual framework consisted of

equity, quality, efficiency, and community participation (Health Service Network Development Institute, 2003).

Significance and characteristics of primary care provisions are to provide care for all population in remote areas with various methods. Primary care service refers to healthcare provision for all the population (all age groups and all health statuses) including holistic and continual care (Hanucharurnkul, 2003). Health statuses refer to statuses of people who are healthy, at risk, and sick including those at the end of life. The healthcare provision includes health promotion, disease prevention, basic medical care, rehabilitation, chronic illness management, and palliative care. Furthermore, primary care needs coordination with specially serviceable network. Challenged tasks for primary care provision include empowerment of the population, influence of community participation, promotion of self care methods, and encouragement of local resource utilization. The primary care provisions are comprised with first contact, longitudinal care, comprehensive care, and coordinate care as following:

First contact care. Primary care provision that should be one particular place and healthcare provider serving as point of simply entry into the health system each time a new problem is experienced. It is similar to a gatekeeper in that it means there is a specified place or person of first contact who has become well accepted as a desirable approach to organizing services. This provision should be accessible to the population who would use it when new problems arise. The first contact care is assessed by using five characteristics, i.e., availability, accessibility, accommodation, affordability, and acceptability.

Availability. Primary care provisions make the clients able to obtain good care for themselves and their family when they need it. They can find the PC

providers and be treated by them at any place of the PCUs. Clients' satisfactions are showed that primary care is well availability of first contact care.

Accessibility. Primary care provisions are convenient to people because their PC provider's offices are closed to their homes. They can find and be treated by the PC providers at any time.

Accommodation. Primary care provisions make it easy for people to get in touch with their PC providers. They can be treated rapidly.

Affordability. Primary care provisions of the clients who are received high quality of care from the PC providers can pay at low-priced healthcare services.

Acceptability. Primary care provisions make people appreciate the PC providers and PC providers' offices. They can trust them and be satisfied with them.

Longitudinal care. Primary care provisions that provide care for all age groups of people, e.g., new born, children, adults, and aging. Furthermore, longitudinal care consists of all kinds of healthcare, e.g., antenatal care, maternal and child care, acute care, chronic care, and palliative care. The PC providers come to know patients and their problems over time while the patients come to know them with community involvement. The essence of longitudinal care is encompassed by the term 'case management' (managed care).

Comprehensive care. Primary care provisions provide care by using broad range (holistic care) of services. They are integrated methods of care, i.e., health promotion, disease prevention, cure and care, rehabilitation, and continuing care.

Coordinate care. Primary care provisions with available information are significant to coordinate PC providers and the clients. Prior problems, services, and needs are detected early for current care.

According to primary care unit (PCU) in Thailand, almost all the PCUs are under the jurisdiction of the district health department and community hospital, MOPH. The PCUs are run by a healthcare team, e.g., public health workers and professional nurses. PC providers work both full-time (from Monday to Friday) and part-time (by scheduled and special situations, e.g., shortage of PC providers, specific clinical needs, etc).

Certain aspects of primary care in other nations are different from some aspects of primary care in Thailand. Organizational management, health policy, and personnel roles are significantly different causes. Primary care personnel in other countries are required to possess specific competencies in each profession such as professional nurse and nurse practitioners who provide PC care (Carnwell & Daly, 2003; Mackey & McNeil, 2002; Mundinger et al., 2000; Sox, 2000; Valderrama, 2004). In addition, other professionals who work in PCU are included, e.g., physicians who specialize in family medicine, physical therapists who specialize in dysmorphism, dental hygienists and dentists who provide oral care, and occupational therapists who advise on occupations and detect occupational problems (Chen, Ervin, Kim, & Vonderheid, 1999; Lundgren & Houseman, 2002).

The majority group of PC providers in Thailand consists of professional nurses and nurse practitioners (4-month training), public health staffs, health officers, chief health centers (public health directors), midwives, and practical nurses. While minority group of PC providers in Thailand consist of physicians, pharmacists, dentists, physical therapy, and technicians. The primary care competency and role of both groups are provided acute and chronic care that is similar to primary care professionals in international countries. Moreover, Thai primary care provisions

include many other aspects of tasks, e.g., information management, health system management (based on healthcare policy), quality management, and organizational management (MOPH, 2001; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002, Srisuphan, 2004). Therefore, primary care competency of PC providers in Thailand and other countries are different according to their roles which are influenced by culture, healthcare system, and policy.

In conclusion, primary care is healthcare provision system which is many definitions based on the authors' views. Significance and characteristics of primary care provisions are to provide care for all population in remote areas with various methods. According to primary care unit (PCU) in Thailand, almost all of them are under the jurisdiction of the district health department and community hospital, MOPH. Certain aspects of primary care in international are different from some aspects of primary care in Thailand.

Primary care competency

Based on competency, components which consist of knowledge, skill, and trait are important for the PC providers. Primary care provisions are a broad range of services (simple to complex). Knowledge is a significant competency of the PC providers to understand facts and procedures. Skill/ability is also a significant capacity of the PC providers, assimilated or acquired through their experience in providing primary care. Trait/personality characteristic (e.g. self-control or self-confidence) is essential personal competency of the PC providers to exhibit or demonstrate in their work. When primary care is provided, the PC provider has to integrate knowledge and skill, and then act in a service-minded manner (trait). Therefore, knowledge, skill, and trait are

important components of primary care competencies for the PC providers to demonstrate in their work.

In addition, the present study, primary care competency for Thai PC providers consisted of five domains. They were composed of health assessment, healthcare management, integrated healthcare service, professional responsibility, and communication. They were derived from previous studies and related literature, especially nursing standard of the Thailand Nursing Council and nursing research. The details of each domain are as follows:

1. Health assessment

Health assessment refers to PC providers' performance of assessing all aspects of clients' health status and healthcare services. Data gathering, screening, recording and reporting, and making diagnosis are aspects of health assessment.

Health assessment is important to PC providers. It enables PCU to achieve its goals, especially longitudinal care and comprehensive care. According to health status assessment, the clients whether they are healthy, at risk, and sick are provided care by the PC practitioners. The data of health assessment will be used to plan provision of primary care. Thus, health assessment skills are needed by the PC providers.

Health assessment is a significant competency for the Thai and international PC providers. It is one of the required core competencies specified in the regulations of many healthcare professional agencies, such as American Board of Internal Medicine – ABIM, the College of Physicians and Surgeons of Alberta - CPSA (Lockyer, 2003), American Association of Occupational health Nurses – AAOHN (AAOHN, 2003; Strasser, 2003), the Public Health Nurses, U.S.A. (Quad Council of

Public Health Nursing Organizations, 2004), American Family Physicians – AFP (2005), British Columbia Nurse Practitioners, Canada (Registered Nurses Association of British Columbia-RNABC, 2003), and Thai general nurses and midwives competency (Boontong, 2001).

Health assessment skills consist of five domains. They are data gathering (demographic data, signs and symptoms), health screening (identification of health concerns and risks), and diagnosis (identification of health problems and needs). In addition, communication (verbal and nonverbal), writing and reporting are included for the competency of health assessment. Those domains of health assessment are indicated by the American Family Nurse Practitioners Association (2004) and American Family Medicine - AFM (2007), the American Nurse Practitioner (American Association of Colleges of Nursing-AACN, 2002, 2004), and the Bureau of Nursing, MOPH (2003). Thus, evidence shows that health assessment competency is important for PC providers.

In conclusion, health assessment refers to PC providers' performance of assessing all aspects of clients' health status and healthcare services. It is a significant competency for the Thai and international PC providers. Health assessment competency consists of five domains.

2. Healthcare management

Healthcare management refers to the process of working through resource preparation in order to provide primary care. Major tasks of the PC providers are planning, implementation, and evaluation of primary care provision. Information and resource management, quality improvement, and risk management are components of

healthcare management competency. In addition, the PC providers plan and manage financial resources, PCU service systems, and continual quality improvement. Those are important for the PC providers who are highly trained in healthcare management. The PC providers have to manage the healthcare service system to the greatest benefit of their clients. They plan to provide healthcare services to cover all segments of population, those who are healthy, at risk, and those who are sick of all age groups. PCU services can achieve its goals of providing longitudinal, coordinated, and comprehensive care.

Healthcare management has been proposed as a core competency by many professional agencies. For example, Quad Council of Public Health Nurses in the U.S. (Quad Council of Public Health Nursing Organizations, 2004) stated that policy implementation, financial management, planning, goal setting and outcome evaluation, program development and quality improvement were importance of healthcare management. In addition, clinical management, managing complexity and promoting health, primary care administration, and maintaining performance are some domains of the AFM' s competencies. Those are similar to the standard of healthcare management of primary care services for Thai PC providers (nurse and midwife) (Bureau of Nursing, 2003; Srisuphan, 2004), nurses practitioner competency of New Zealand nurses (Nursing Council of New Zealand, 2004), and primary care competency of the American nurse practitioner and the American clinical nurses specialist (AACN, 2002; 2004).

Furthermore, the competency of Thai healthcare professionals as stated by Thailand Nursing Council (Boontong, 2001) focuses on healthcare management skills in the areas of administration. Those aspects are congruent with the recommendations for

the PC providers' competencies proposed by many research studies (Hattakit et al., 2001; Homteep, 2006; Nuntaboot, Leelakraiwan, Sangchart, Shokebumroong, Buajaroen, Charoenchai et al 2001; Phusing, 2002; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002, Thongton, 1999; Wongprayoon & Authid, 2004). In addition, some professional agencies in Canada mentioned that healthcare management skills include the administration of care, i.e., care management, disease management, medical management, therapeutic intervention, health counseling, quality improvement, and risk management (College of Registered Nurses of Nova Scotia, 2002; RNABC, 2003; SRNA, 2003). Thus, previous evidences clearly show that healthcare management competencies necessary for the PC providers are strategic planning, organizational management, personnel management, policy development, financial management, internal-external coordination, information management, and quality improvement and risk management

3. Integrated healthcare service

Integrated healthcare service refers to the implementation of primary care involving four dimensions, namely, health promotion, health prevention, health cure/care, and health rehabilitation. It is the application of a broad range of primary care provisions which need to apply the method of service for clients of all age groups and of all conditions, i.e., the healthy, those at risk, and the sick. Integrated healthcare services can be achieved by having available services that are directly provided when the need arises.

Integrated healthcare service is essential to the PC providers to provide primary care. In Thailand, a PC provider must provide care to all people unlike those in USA who

provide care only to a specific patient under area-based. Thus, the PC providers in Thailand need high competency of integrated healthcare service skills.

From the literature review, the competency of providing integrated healthcare service, many healthcare professional agencies such as the American Nurses Practitioner in primary care and clinical nurse specialist (AACN, 2002, 2004), American Board of Internal Medicine by the American Family Medicine - AFM (2007), Family Nurse Practitioner (2004), and Thailand Nursing Council (Boontong, 2001) mention health promotion, illness protection, and injury prevention as importance to healthcare provision. The integrated healthcare service competency of treatment, therapeutic care, and continuing care are also required for healthcare practitioners of Nova Scotian and of British Columbian, Canada (College of Registered Nurses of Nova Scotia, 2002; RNABC, 2003). Moreover, the Organization of Public Health Nurses and AFM in the U.S. (AFM, 2007, Family Nurse Practitioner, 2004; Quad Council of Public Health Nursing Organizations, 2004) states that community and public healthcare competency consist of health promotion, community and public health service. Those competencies are congruent with the standard of primary care services for Thai PCU (Srisuphan, 2004). In addition, healthcare services in PCUs (Bureau of Nursing, 2003) emphasize four aspects of integrated healthcare, i.e., health promotion, health prevention, basic medical care, and health rehabilitation. Furthermore, research studies support that the four aspects of integrated healthcare service are important to Thai PC providers (Pongpipattanapan, 2002; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002, Senkaew, 2005).

Thus, the evidences indicate that integrated healthcare competency necessary for the PC providers are health promotion, disease prevention, treatment/ prescription (basic medical care), and health rehabilitation.

4. Professional responsibility

Professional responsibility refers to PC providers act and responds to the public in their practice and conduct which meet all legislative requirements and professional standards. The competency of the PC providers must be combined with professional, legal, and ethical and cultural responsibility. The PC providers need to demonstrate professional provisions. They are accountable for their actions and decisions in practices in order to maximize clients' safety.

The PC providers are responsible to roles and job-descriptions for development of their practice. They should well understand their roles in PCU and know how to manage their responsibility. As indicated in other studies, PC providers are confused about their roles (Konggumnerd, 2003; Pengpara, Jongjirasiri, & Hongsampai, 2003; Pongpipattanapan, 2002). Thus, competency of PCU service is significant for the PC providers. Those authors clarified that competency including roles and job-descriptions are needed for the PC providers. Furthermore, healthcare profession, legal requirements, professional code of ethic, and ethical standards of PCU tasks are necessary for the PC providers to provide primary care for their clients.

Professional responsibility is embodied in many professional regulations. Although some healthcare profession agencies do not focus on professional responsibility, they are concerned with and emphasize levels of quality, standards, service improvement, and patient advocacy. The primary care competency of the American nurse practitioner and

clinical nurse specialist (AACN, 2002, 2004) emphasizes that the practitioner's commit to provide optimal primary care for the patients. The SRNA of Canada (2003) states that standard of care can be improved by professional responsibility. Professional development and professional regulations are improved by the professional code of ethics that focuses on practitioners' competency of the New Zealand NPs (Nursing Council of New Zealand, 2004). The RNABC of British Columbia, Canada (2003) mentions that understanding the practitioners' roles is important in providing healthcare. The competency of Thai general healthcare professionals (Boontong, 2001), the standard of primary care services for Thai PC providers (Srisuphan, 2004), and the competency of Thai civil government (Jamjuree, 2005) suggests that ethical/integrity involves the competency of healthcare professionals and the standard of healthcare services. It is similar to the competency of AFM (2007) and includes maintaining an ethical approach to practice and demonstrating integrity, empathy, and compassion (Evans, Elwyn, & Edwards, 2004).

Therefore, the aspects of professional responsibility, as previously mentioned, which are essential for the PC providers. There are ethical/integrity, patient rights and professional code of ethics, patient advocacy, professional development, self development and research, healthcare quality improvement, and healthcare quality assurance.

5. Communication

Communication refers to the activity of expressing ideas and feelings or of giving people information (Hornby, 2000). It is the exchange of thoughts, messages, or information by speech, signals, writing, or behavior. The PC providers should interact

with art and good technique in using words effectively to impart information and ideas to the clients. Communication competency incorporates leadership, human relations, human empowerment, and team development competency enabling the PC providers to participate and collaborate with clients and a disciplined healthcare team in their work.

Communication competency is essential for the PC providers because they interact with people of different backgrounds and groups varying in age, sex, education, occupation, income, ethnicity, and religion. The PC providers provide information to their clients, imparting health education, health consultation, health assessment, and other primary care. The nature of the tasks of the PCU's requires collaboration among multidisciplinary health teams. However, many studies report that the PC providers face problems in collaborating (Chutinuntakul, 2004; Hasnwanakij, 2002; Lapying & Srithamrongsawat, 2003; Kongkumnerd, 2003; Pengpara, Jongjirasiri, & Hongsampai, 2003; Pongpipattanapan, 2002). Evidence indicates that the PC providers find themselves in conflict with their colleagues because of a lack in collaborative skills (Kongkumnerd, 2003; Pengpara, Jongjirasiri, & Hongsampai, 2003). Thus, it is vital to enhance collaborative skills and the experience of team working for the PC providers and other healthcare team. When they maintain a cooperative relationship amongst themselves, they are able to carry out their tasks more easily. Greater trust will exist among PC providers, patients and interdisciplinary health teams. Thus, communication competency is important for the PC providers.

Communication competency is found in many professions regulations. This indicates that healthcare and effective role performance are dependent on effective

communication. For example, the American Nurse Practitioner and Clinical Nurse Specialist (AACN, 2002, 2004) stated that the practitioner's role is to deliver primary care with respect to culture and spiritual beliefs of their clients. This is similar to the AFM stated that communication, humanistic, and cultural skills are significance to physician's practice (AFM, 2007; Evans, Elwyn, & Edwards, 2004). The PC provider's collaborate with their multidisciplinary healthcare teams to enhance effectiveness in providing patient care (Keuhn, 2004). Similarly, the chief officer of the International Council of Nurses-ICN (2000) stated that effective collaboration among healthcare professionals is a vital key in delivering cost effective and quality healthcare. Additionally, the RN Alberta Association (Alberta Association of Registered Nurses, 2000) and Nursing Council of New Zealand (Nursing Council of New Zealand, 2004) emphasized that the collaborative competency is important to practitioner's in providing healthcare service and in working effectively among interdisciplinary health teams. The public health nurse of Quad Council, the U.S. (Quad Council of Public Health Nursing Organizations, 2004) stated that both verbal and non-verbal communication skills lead to effective communication while the AFM presented that communication and consulting skills are essential for the physicians. In Thailand, many authors stated that communication skills, i.e. human relationship, patient empowerment, teamwork, leadership, and professional networking, are necessary in providing primary care (Boontong, 2001; Hatthakit et al., 2001; Bureau of Nursing, 2000; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002; Sungsuwan, 1995; Thailand Nursing Council, 1999).

Communication competency is important for PC providers in providing healthcare services and collaborating with the healthcare team. Many professional

agencies have indicated that communication competency consist of leadership, human relations, cultural competency, community empowerment, professional network coordination, health care team participation, and language and speech.

In conclusion, the conceptual structure of primary care competency for Thai PC providers consisted of five domains, i.e., health assessment, healthcare management, integrated healthcare service, professional responsibility, and communication. These were derived from a literature review of international regulations of health professional competency, and Thailand Nursing Council standards related to PC providers' competency and research studies on primary care competency in Thailand.

Primary care competency assessment

Primary care competency assessment has been conducted before PC providers' competency had been continually developed. Based on evidence, PC providers have faced many problems due to lack of sufficient knowledge and skill that would enable them to provide primary care for each group of clients. Primary care is a basic level of care provision for all age groups. It is important to promote clients' health. PCU needs PC providers with high competency to provide care. Thus, primary care competency has to be assessed for competency evaluation and improvement. The PC providers can be assessed in their primary care competency by using primary care competency assessment tool. However, based on literature review, the primary care competency assessment instrument did not exist.

Instruments for assessing competency of PC providers were related to recent studies by several researchers. The current instruments have criticized their validity

and reliability, e. g., the Nurse Competency Scale - NCS (Mertoja, Isoaho, and Leino-Kilpi, 2004), the King's Nurse Performance Scale (Fitzpatrick, While & Roberts, 1994), the Professional Associate Rating- PAR (Ramsey et al., 1999 as cited in Evans, Elwyn, & Edwards, 2004), the Six-Dimension Scale - 6D Scale by Schwirian (1978 cited in Coates & Chambers, 1992; Chambers, 1998; Girot, 1993; Meretoja & Leino-Kilpi, 2001; Robb, Fleming, & Dietert, 2002), the Peer Assessment Questionnaire – PAQ (Hall, et al., 1999 cited in Evans, Elwyn, & Edwards, 2004), the Internal Coalition Effectiveness - ICE instrument (Cramer, Atwood & Stoner, 2006), the Peer Review Evaluation Form (Thomas et al., 1999 cited in Evans, Elwyn, & Edwards, 2004), and the Competency Inventory for Registered Nurses -CIRN (Ming, 2005). In addition, a review of current literature examined how the concept of competency had been applied in existing instruments and how those instruments related to the competency concept (Meretoja & Leino-Kilpi, 2001; Waddell, 2001). The review revealed that those instruments were intended to assess the competency of different groups of practitioners. However, few studies were found to be related to primary care competency of the PC providers as the followings:

The Six-Dimension Scale (6D Scale) of Practitioner Performance (Schwirian, 1978 cited in Meretoja, Isoaho, & Leino-Kilpi, 2004) consists of 52 clinical performance behavior items rated on a four point rating scale. Clinical performance behaviors are general to most clinical areas with six sub-scales, i.e., leadership, teaching/collaboration, planning/evaluation, interpersonal communication, critical care, and professional development. The scale is usually used to assess clinical practitioner competency and to be used in comparison with a new competency instrument for criterion-related validity testing (Meretoja, Isoaho, & Leino-Kilpi,

2004; Snyder, 1997). The scale is appropriate to be used for assessment of clinical nurse competency and assess competency of the PC providers.

The Internal Coalition Effectiveness (ICE) instrument (Cramer, Atwood, & Stoner, 2006) was based on the conceptual model “Internal Coalition Outcome Hierarchy.” Sixty-one of the ICE items were derived from literature on successful coalitions. Its content validity was conducted by a national panel of eight experts. CVI analysis of 61 items was 0.88, 20 items were deleted because they did not meet the level of significance in the CVI. On the other hand, 41-item resulting from the CVI = 0.88, were used a 5-point response format to measure agreement with each item (5 = strongly agree, 4 = agree, 3 = unsure, 2 disagree, and 1 = strongly disagree). Internal consistency was evaluated by the coalition member and leaders (n = 61). The Cronbach’s coefficient alpha was 0.70 whereas the bivariate Pearson’s correlation coefficient $r = 0.30 - 0.70$. Construct validity was assessed by correlation analysis, independent student’s t-tests, and informal coalition feedback. The final 30 items were retained. It was a valid and reliable instrument for measuring the internal effectiveness of community coalition. However, the ICE had significant application for public health practitioner working as evaluators for coalitions engaged in community health programming.

The Competency Inventory for Registered Practitioners (CIRN) in the People’s Republic of China (Ming, 2005) was developed. Its content validity-CVI = 0.85. Its internal consistency testing by using Cronbach’s alpha coefficient was 0.89; and the Cronbach’s alpha for individual dimensions ranged from 0.79 to 0.86. The criterion-related validity was indicated by association between CIRN and Six-D scale ($r = 0.44, p = 0.04$). The contrasted group validity was demonstrated with the CIRN

differences between clinical practitioners and the first year health professional student ($p < 0.0001$). The final CIRN was composed of seven dimensions with 58 - items. However, the CIRN has been used to assess the competency for the registered practitioners in the People's Republic of China.

The Professional Associate Rating – PAR was developed by Ramsey et al (1996 cited in Evans, Elwyn, & Edwards, 2004). It was used to assess physicians' performance/competency by professional peers' reviews. They reflected domains of American Board of Internal Medicine recommendations for evaluation of humanistic qualities. The psychometric data consisted of coefficient generalizability ranging from 0.64 with four peer raters to 0.82 with ten peer raters, which provided satisfactory technical evidence of internal consistency.

The Peer Assessment Questionnaire- PAQ was developed by Hall et al (1999 cited in Evans, Elwyn, & Edwards, 2004). It was used to assess physicians' performance/competency by peers in scope of broad principle of 360 degree of multi-source feedback (MSF). The psychometric data consisted of coefficient generalizability ranged from 0.73 to 0.82. The explicit aim was used for quality improvement by education rather than identification.

In Thailand, there is some research related to primary care competency (Boontong, 2000; Dounkwan, 2004; Homteep, 2006; Kongjun, 2000; Senkaew, 2005; Wongprayoon & Authid, 2004). One research study developed a competency assessment scale for nurse directors in community hospitals (Pidchayanon, 1999). The instrument was a rating scale to assess the level of competency for nurse directors in community hospitals. Three aims were examined, the first was to evaluate its construct validity through known group technique; the second was to test discrimination indices, and the

third was to examine reliability and a normalized T-score. Results indicated that the construct validity of the entire assessment scale and of each factor tested by known group technique was highly significant ($p < .01$). The discrimination indices of each item were significantly different ($p < .01$). The reliability of the entire assessment scale, using Cronbach's alpha coefficient was 0.98, while the reliability of each factor ranged from 0.89 to 0.97. The raw score and normalized T-score of the entire assessment scale ranged from 1.00 - 4.79 and 16 - 77 respectively. The raw score and normalized T-score of each factor ranged from 1.00 - 5.00 and 17 - 80 respectively (Pidchayanon, 1999).

In conclusion, primary care competency assessment is conducted before PC providers' competency was continually developed. Based on evidences that PC providers had faced many problems, the knowledge and skills are lacked to specially provide primary care for each group of clients. Instruments for assessing competency of PC providers have been related to recent studies by several researchers. In Thailand, there is some research related to primary care competency. One research study developed a competency assessment scale for nurse directors in community hospitals.

Instrument development

Theoretical foundations

The theoretical foundation for the development of the PC-CAS was the classical theory (CT). Classical theory is a simple and useful model that describes how error of measurement influences the observed score. The basic tenet of this theory evolved from the assumption that random error is an element that must be considered in all measurements. In

the classical theory, each observed score can be regarded as the sum of the true score and a random error (Waltz, Strickland, & Lenz, 1991).

Reliability is an outcome of classical theory (CT). The reliability of measuring device is directly influenced by random error. The higher the reliability of the measurement, the less random error is introduced into the measuring procedure (Waltz, Strickland, & Lenz, 1991). The reliability is used to estimate the ratio of variance in true scores to variance in observed scores. Reliability influences the measurements in the behavioral sciences in several ways. Random error can never be completely eliminated but one should seek to minimize it as much as possible. Minimizing the error score and reducing the difference between observed and true scores is desirable. Nunnally and Bernstein (1994) described two definitions of reliability. The first is the freedom from random error, i.e., how repeatable observations are (1) when different persons make the measurements, (2) when alternative instruments are used to measure the same phenomenon, and (3) when incidental variation exists on multi-item tests and internal consistency or high correlation among components of the overall measure. The second definition of reliability is stability over time (occasions). The two definitions of reliability are basically independent in that a test may have high temporal stability. The measures that have high temporal stability are called “trait measures”, and measures that have low temporal stability are called “state measures” (Nunnally and Bernstein, 1994). In general, a longer interval between testing may result in lower temporal stability.

In this study, the classical theory was used as the theoretical foundation in the reliability evaluation of the PC-CAS. According to the CT, the freedom from random error, the Cronbach’s alpha co-efficiency was used to examine the internal consistency of the PC-CAS. Because when different persons make the measurements, the incidental variation

exists on multi-item tests, and alpha correlation among items and components of the overall measure would be determined. It indicated that the items and components of measurements had an internal consistency. The alpha correlation among inter-items and sub-items has to be strictly taken into account in item analysis. The items with appropriate alpha correlation among inter-items, sub-items were kept. In addition, the classical theory was used as the theoretical foundation in the stability evaluation of the PC-CAS. Because competency is the outcome of learning, training, and having experience, the characteristic of a state measure is expected. However, it can be static for a period of time. Therefore, the stability of the PC-CAS was examined by using test-retest over a 2-week interval.

In conclusion, the theoretical foundation for the development of the PC-CAS was the CT. Reliability was the outcome of classical theory. It was used to estimate the ratio of variance in true scores to variance in observed scores. In this study, the classical theory was used as the theoretical foundation in the reliability evaluation of the PC-CAS. The Cronbach's alpha co-efficiency was used to examine its internal consistency.

Scale development

The main purpose of this study is to develop an instrument to measure competency of the PC providers and to evaluate its validity and reliability. DeVellis' 8 - step of scale development was modified, i.e., (1) determine clearly what is to be measured, (2) generate an item pool, (3) determine the format for measurement, (4) have an initial item pool reviewed by experts, (5) consider inclusion of validation items, (6) administrate items to develop sample, (7) evaluate the items, and (8) optimize scale length. According to DeVellis (1991), step # 1 to step # 4 was adopted in the process of PC-CAS development. A format of generated items was

appropriately selected. Then, the item pool was examined and validated by experts through three rounds of Delphi technique.

The adopted 4 - step of DeVellis are presented as follows:

Step # 1: Determine clearly primary care competency for PC providers in Thailand is to be measured. In this step, these questions were asked: (a) should the scale be based on theory? (b) how specific should the measurement be? (c) should some aspects of the phenomenon be emphasized more than others? Waltz, Strickland and Lenz (1991) mentioned that a measuring instrument's conceptual base is the link between theory and measurement. In this study, the concept of competency is the outcome of learning, training, and experience.

Step # 2: Generate an item pool. This step is to generate a large pool of items that are candidates for eventual inclusion in the scale. The method of generating an item pool is as follows: (a) choose items that reflect the scale's purpose, (b) prefer redundancy to be over inclusive, (c) accept that it is impossible to specify the number of items that should be included in an initial pool, (d) list all the things that make an item good or bad is an impossible task, (e) include both positively and negatively worded items. An item pool should be a rich source from which a scale can emerge. In this study, the generated items for measuring primary care competency for PC providers were developed from a literature review and data from interviewing of the PC providers, directors of PCUs, nursing experts, and other public health workers. The items attempted to reflect primary care competency of the Thai PC providers who work at PCUs consisting of knowledge, skill, and trait of the PC providers required in performing tasks in the PCUs. In this step, the pre-specified domains from literature reviewed and themes of interview data were merged to develop core domains of the

PC-CAS; then the construct was used to generate its item pool. Expert opinions were sought through three rounds of Delphi technique.

Delphi technique

Delphi technique is a survey technique designed to structure group opinion and discussion (Goodman, 1987). The Delphi technique, receiving its name from the famous Greek oracle at Delphi, was developed by Rand Corporation in the 1950's. Delphi is being increasingly employed in nursing, as it is important to explore issues of consensus, validity and reliability (Williams & Webb, 1994). This method uses several rounds of questions to seek a consensus on a particular topic from a group of experts. The purpose is to obtain group consensus from the panel of experts without bringing this group together in a face-to-face meeting. This type of procedure is appropriate in examining the opinions, beliefs, or future predictions of knowledgeable people on some special topic of interest (Nieswiadomy, 1998). Linstone and Turoff (1975 cited in Waltz, Strickland, & Lens, 1991) suggested a variety of applications for Delphi: (1) gather current and historical data not accurately known or available, (2) examine the significance of historical events, (3) evaluate possible budget allocations, (4) explore planning options, (5) plan program and/or curriculum development, (6) collate the structure of a model, (7) delineate the pros and cons associated with potential policy options, (8) develop causal relationships in complex economic or social phenomena, (9) distinguish, clarify real and perceive human motivations, and (10) expose priorities of personal values and/or social goals including seeking out information on which agreement may later be generated. The anonymity of participants in a Delphi study is usually regarded as important because

representativeness of participants will affect the potential ideas (Gibson, 1998; McKenna, 1994). The strengths of this technique are flexibility in method, freedom from social pressure, personality influence and individual dominance, achievement of expert consensus, a reliable judgment of forecast results, validity improvement, height face validity, and lowness expense. However, the weaknesses of this technique are: decrease of response rate, possibility of respondent non - representative, requirement of adequate time and participant commitment, and many time-consuming processes (McKenna, 1994; Williams & Webb, 1994). The Delphi technique is usually used for two or three rounds (Crisp, Pelletier, Duffield, & Adams, 1999; Michigan State University Extension, 1994).

Expert consensus through three rounds of the Delphi technique is used to examine, regenerate, and validate the item pool. In this study, in the first round, experts were asked to agree or disagree on each item of the first draft which was presented through PC-CAS's domains and their components. And then, the experts' recommendations and suggestions were given. Agreed items were indicated that they were retained whereas disagreed items were showed that they were deleted but some items of this group were revised based on the experts' suggestions. In the second round, the domains of the PC-CAS and components of each domain needed experts' consensus on priority rating for their categories. In the third round, the priority rating for each domain's and their components' categories were confirmed by the experts after they had known results of all experts' consensus which were analyzed by mode, median, mean, percentage, standard deviation, and interquartile range (IQR). In addition, the final draft of item which was accumulated through experts' consensus was presented.

Step # 3: Determine the format for measurement. Numerous formats for questions exist. The researcher considered early what format is to be used. This step occurred simultaneously with the generation of items so that the format and the items are compatible. The format for measurement might be determined using various models, e.g., Thurstone scaling, Guttman scaling, Likert scale, rating scale, semantic differential, visual analog and binary options. The theoretical models presented are more consistent with some response formats than with others (DeVellis, 1991; Jacobson, 1997; Waltz, Strickland, & Lenz, 1991). In this study, a rating scale was used as the format for this measurement. The scale descriptors consisted of three pairs, i.e., (1) “disagree” to “strongly agree,” (2) “not true at all” to “extremely true,” and (3) “never performed” to “always perform”. Those scales were ranged from “0” to “5”. The descriptors of rating scale format were selected to avoid a neutral and ambivalent midpoint. Therefore, the rating scale on six levels would contribute to releasing a bias in the answers more than a tool with odd number of choice levels whose mid-point is often chosen (Jones & Kay, 1992).

Step # 4: Have the initial item pool reviewed by experts. The process is to have a group of knowledgeable people in the content area to review the item pool. The proving content by experts provides an early opportunity to identify weak items that were found during Delphi technique. The experts select items according to their accuracy and relevancy of the specific content of the primary care competency. In this process, the investigator had a set of items that had been reviewed and validated by experts.

In conclusion, four steps of DeVellis’ scale development were modified to develop the PC-CAS in the phase of scale development. And then, evaluations of its

psychometric properties were conducted. Those steps consisted of determining clearly what is to be measured, generating an item pool, determining the format for measurement, and having the initial item pool reviewed by experts.

Psychometric evaluation

Psychometric properties are standardized measures for psychological constructs (Knibb, 2004). They try to quantify traits or behaviors and represent the individual characteristic of each person on the construct. The different test scores should represent individual differences in the construct (Knibb, 2004). Waltz, Strickland, and Lenz (1991) stated that evaluating the adequacy of any existing instrument requires considering its definition, concept basis, and psychometric properties. Bollen (1989 cited in Gau & Lee, 2003) proposed that two important properties of measures are reliability and validity. Research shows evidence of good reliability and initial validity by using internal consistency, content validity, and construct validity. Goodwin (1997) indicated that the most important method to establish validity of an instrument is construct validity. Waltz, Strickland, and Lenz (1991) outlined four specific techniques used to establish the construct validity of an instrument. These techniques include the multitrait-multimethod approach, factor analysis, the known group technique, and the hypothesis testing approach.

Reliability evaluation

The reliability of an instrument concerns its dependability, consistency, stability, and accuracy. All terms refer to the instrument's ability to produce the same results on repeated measures. The degree of reliability is usually determined by using

correlational procedures (Knapp, 1991). Correlation coefficients can range between – 1.00 and +1.00. Positive correlation of reliability is expected. A correlation coefficient above 0.70 is considered satisfactory for a newly developed instrument (Burns & Grove, 2001; Lynn, 1985; Polit & Hungler, 1995). In addition, the percentage and rate of agreement may also be used to determine the reliability when observers and raters are used in a study (Knapp & Brown, 1995; Waltz, Strickland, & Lenz, 1991).

The reliability was influenced by several sources. Generally, the more items that an instrument contains, the more reliable the instrument will be. The likelihood of coming closer to obtaining a true measurement increases as the sample of items to measure a variable increases (Nunnally & Bernstein, 1994; Waltz, Strickland, & Lenz, 1991). Nevertheless, caution must be taken concerning the reliability of instruments. If a test becomes too long, subjects may become tired or bored (DeVellis, 1991, Nieswiadomy, 1998). Reliability is not a property of the instrument that, once established, remains forever. Reliability must continually be assessed as the instrument is used with different subjects and under different environmental conditions (Nunnally & Bernstein, 1994; Waltz, Strickland, & Lenz, 1991). Two different types of reliability used in this study will be discussed.

Stability

The stability or test-retest reliability of an instrument refers to consistent results being obtained on repeated administrations of the measurement (Nunnally & Bernstein, 1994). The instrument is administered to a group of people, and after conduction in a period of time the instrument is administered to the same people again. If the subjects' responses are almost identical both times, the instrument is

determined to have high stability. If the scores of two times' administration are perfectly correlated, the correlation coefficient of alpha would be 1.00 (Knapp & Brown, 1995). The interval between two testing periods may vary from a few days to several months or even longer based on variables (Nunnally & Bernstein, 1994; Waltz, Strickland, & Lenz, 1991; Washburn, Heath, & Jackson, 2000). However, the appropriate time of administration should be two weeks (Nunnally & Bernstein, 1994). The competency was the outcome of training, continuing study, and having experience. It could be static for a period of time. Two-week interval was appropriate time for its stability because the examinees could not remember the questionnaires, which might affect the stability of the characteristic being measured (Nunnally & Bernstein, 1994). If it used a short time the subjects could remember the questionnaires, while it used a long time it might waste time or other resources and might have affected the stability. Therefore, in this study, 2 - week interval of test-retest was used to evaluate the stability of PC-CAS. The test-retest was an appropriate approach to test the PC-CAS's stability with the PC providers.

Internal consistency

Internal consistency or scale homogeneity addresses the extent to which all items on an instrument measure the same variable (DeVellis, 1991). This type of reliability is appropriate only when the instrument is examining one concept or construct at a time. A homogenous instrument contains items that are closely correlated with each other and has higher inter-correlations among the items, which show greater internal consistency of the instrument (DeVellis, 1991; Knapp, 1991, Waltz, Strickland, & Lenz, 1991).

Several procedures can be used to measure the internal consistency of an instrument. A common type of internal consistency procedure used today is the coefficient alpha or Cronbach's alpha, which provides an estimate of the reliability of all possible ways of dividing an instrument into two halves. It is based on the strength of inter-correlations of all items in the instrument as well as the number of item used (Wilkin, Hallam & Goggett, 1992). Furthermore, Cronbach's alpha is widely used as a measure of reliability, less self-evident than the case for other measures of reliability (alternate forms methods), and sound basis for comparing how other capture the essence of reliability (Devellis, 1991). Its acceptable value is considered when the estimate is grater than or equal to 0.70 (Lynn, 1985). In this study, the Cronbach's alpha coefficient was used to evaluate the internal consistency of PC-CAS.

Validity evaluation

Validity of an instrument relates to the effects of non-random or systematic random (Wilkin, Hallam & Goggett, 1992). The validity of an instrument is the extent to which a measure reflects a concept that it is intended to measure. It concerns whether the variable is the underlying cause of item co-variation (DeVellis, 1991; Waltz, Strickland, & Lenz, 1991). The instrument necessarily retains its level of validity when it is used with other subjects or in other environment settings (Waltz, Strickland, & Lenz, 1991). The procedures for establishing the validity of an instrument are not based on the administration of the instrument, but they are established by a panel of experts and literature reviews (Nieswiadomy, 1998). Validity is inferred from the manner in which a scale was constructed, its ability to predict specific events (DeVellis, 1991). There are essentially three basic types of

validity, i.e., content, construct, and criterion (DeVellis, 1991; Wilkin, Hallam & Goggett, 1992). In this operation, two significant types were conducted, i.e., content validity and construct validity.

Content validity

Content validity concerns the items' content based on the structural concept of variable that is intended to measure. The items of an instrument need to reflect the full range of the attributes of the concept being measured (Lynn, 1986). In other words, the number and types of items are adequate to measure the concept or construct of interest (DeVellis, 1991). There are three methods for evaluating the content validity. The first, a comparison of the content of the items of an instrument is based on the available literature. The second, an examination of the content is sound under concept and variables that are measured by using panel of experts. These experts are given copies of the instrument, the purpose, and objectives of the study. They then evaluate the instrument, usually on an individual basis rather than in a group. The experts are then asked to (1) link each objective with its respective items, (2) assess the relevancy of the items to the content addressed by the objectives, and (3) judge if they believe the items on the tool adequately represent the content in the domain of interest (Waltz, Strickland, & Lenz, 1991). Comparisons were then made between the experts' answers, and the investigator then determined if additions, deletions, or changes need to be made. The third was used when the instrument is being developed. The investigator develops a test blueprint that is designed around the objectives for the content that was expected to measure (Nieswiadomy, 1998). Content validity is

easiest to evaluate when the domain is well defined (DeVellis, 1991). It is important for all measure which is especially of interest for instruments designed to assess. Its focus is on determining whether or not the item sampled for inclusion on the tool adequately represent the domain of content addressed by the instrument (Waltz, Strickland, & Lenz, 1991).

In this study, content validity evaluation has used the second method. The PC-CAS was examined and validated by four experts (three nursing experts and one medical expert). The content validity index of .80 or greater being desired (Davis, 1992; Burns & Grove, 2001; Lynn, 1986).

Construct validity

Construct validity is directly concerned with the theoretical relationship of variable to other variables. It is the extent to which a measure behaves the way that the construct it purports to measure (DeVellis, 1991). A construct is a concept or abstraction that is created by the researcher. Construct validity involves the measurement of a variable that is not directly observable but rather is a construct or abstraction derived from observable behavior (Nieswiadomy, 1998). It is derived from the underlying theory that is used to describe or explain the construct (DeVellis, 1991; Nieswiadomy, 1998; Waltz, Strickland, & Lenz, 1991). Several methods are used to test construct validity of the instrument, e.g., item analysis, known group technique, Exploratory Factor Analysis-EFA, Confirmatory Factor Analysis-CFA, and hypothesis testing, etc. In this study, three methods, i.e., item analysis, CFA, and

hypothesis testing were used to test construct validity of the PC-CAS as the following presented.

Hypothesis testing. The method is used to test hypothesis based on theory and concept to confirm that an evidence test do not lead to its rejection. The hypothesis is tested by examining evidence implied by empirical data. The hypothesis is accepted when the evidence is consistent with its hypothesis (Pedhazur & Schemlkin, 1991). In this study, the hypothesis testing approach was also used to test the construct validity of PC-CAS. According to Benner's model, the duration of work experience and continuous training and study influence on practical competency (Benner, 1984). If the hypothesis is confirmed, the investigator will claim that the PC-CAS has construct validity and that the PC-CAS is appropriate to measure primary care competency of PC providers.

Item analysis. Descriptive extent is to which probability of response alpha correlates with attribute. Item analysis indicates which items ought to be kept and which items should be removed. According to good item contributions, internal consistency of the test should be increased. Item - total correlations measure the relationship of individual test items to the composite score. They refer to the correlation between an item and the rest of the scale, without that item being considered part of the scale. If the correlation is low, it means that the item is not really measuring what the rest of the test is trying to measure (Sherry, 1997). It measures how much the variability in the responses to the item can be predicted from the other items on the test. If an item does not predict much of the variability, then that item ought to be dropped. Cronbach's alpha or other alpha coefficient should increase when the spurious item is deleted. Deleting the item means that the

instrument would gain internal consistency. Therefore, the item analysis is the most-beneficial test for the initial evaluation of internal consistency and a preliminary test of construct validity before confirmation by other methods.

The alpha correlation of item analysis scores range from -1.00 to $+1.00$. Positive scores are desirable and indicate that the item is really measured in the desired direction. Those items tend to do well on the test or to have a large amount of the measured attribute. An alpha correlation score near zero means that the item is discriminating between items, or subtotals scores of $r \geq 0.30$ are generally accepted as adequate (Jacobson, 1997; Munro, 2001; Waltz, Strickland, & Lens, 1991). The degree between high and low of items' correlation are achievers on the test. The moderate to high which are performed on any one item predicts performance between items and sub-total, and items - total. The alpha correlation of the items among items and among sub-total items has to be low ($r \leq .30$). The best items on any test are the most discriminating (Nunnally & Bernstein, 1994). In this study, item analysis was used to test preliminary construct validity before it was confirmed by CFA.

Confirmatory Factor Analysis (CFA). An approach used to test internal structure of the construct. CFA of a well constructed instrument yielded the result that all items had a significant factor loading (Gau & Lee, 2003). According to it, there are two different approaches to do factor analysis, i.e., Exploratory Factor Analysis (EFA); its purpose is to identify the factor structure for a set of variables and CFA; its purpose is to test and confirm that the tool strongly fits the theoretical foundation (Stevens, 1996). Therefore, EFA is considered a theory-generating procedure, whereas CFA is a theory-testing procedure. CFA is used to test an existing theory, or hypothesized model or structure or to determine which of several models is the best fit

for the data. CFA is a special application of structural equation modeling (SEM). In this study, utilizing CFA is more appropriate than EFA because the PC-CAS is established and based upon theory and a literature review from the documentation of the national level.

There are popular software programs available for conducting CFA: LISREL, EQS, and AMOS. LISREL is the most complex to use and to understand because it relies on matrix terminology and Greek notation (Steven, 2002). LISREL 8.5 for Windows is used to test the goodness of fit of the measurement model. Before performing data analysis, the adequacy of the input and statistical assumptions should be assessed, i.e., (1) normal distribution, homoscedasticity, and linear relationships, (2) error terms which occur in CFA and are not correlated with any of the latent variables and are independent of one another, and (3) control of the sample size so as not to be so large as to approach infinity (at least > 100 samples). Each variable is assessed for skewness and kurtosis, and the entire data set is assessed for multivariate normality (Munro, 2001).

In conclusion, psychometric properties refer to evaluating the standardized measures for psychological constructs of the instrument. Consistency and stability of instrument would have their reliability tested. The stability of an instrument refers to consistent results being obtained on repeated administrations of the measurement. Internal consistency, or scale homogeneity addresses the extent to which all items on an instrument measure the same variable. The validity of an instrument concerns to which a measure reflects a concept which is intended to measure especially content and construct validity. Content validity is concerned with the items' content based on the structural concept of variable that intended to measure the variable. Construct validity

is concerned with the degree to which an instrument measures the construct that it is supposed to measure. Item analysis, CFA, and hypothesis testing were included in construct validity evaluation. In this study, item analysis was conducted to describe the extent to which probability response of alpha correlation with its attribute. CFA was used to test internal structure of the instrument/model and determine which of several models were well fit the data. In addition, Benner's model hypothesis was tested to confirm the characteristics of competency which was change when the people got training, continuing study, and having experiences.

Summary

Primary care service of Thai health care system is essential for Thai people. Primary care competency for Thai PC providers can be developed through continuing education and enhancing PC providers' competency by assessing their primary care competency. A scale for assessing the primary care competency of the PC providers in Thailand and other countries could not be found. Therefore, the PC-CAS had to be developed to assess primary care competency for the PC providers in Thailand. Theoretical foundations of the PC-CAS development were derived from adult learning theory and Benner's model, role theory, and classical theory. The pre-specified domains, i.e., health assessment, healthcare management, integrated healthcare service, professional responsibility, and communication were developed from the literature reviews. Before the PC-CAS was developed, the specified domains of primary competency were established through a literature review and data of interview. And then an item pool was generated and its validation examined through three rounds of the Delphi technique. After the final draft of items was revealed, its

psychometric properties were evaluated. Content validity was reviewed by the panels of experts. Construct validity was tested by using item analysis, CFA, and hypothesis testing. Reliability; stability and internal consistency were tested by using test-retest and Chronbach's alpha coefficient respectively. The last version of the PC-CAS which was sound retained items was indicated that sound an instrument.