CHAPTER 4

RESULTS AND DISCUSSIONS

The purposes of this study were to develop an instrument to measure the primary care competency for Thai PC providers and to evaluate its psychometric properties. The results and discussions will be presented in two parts i.e., (1) development of the PC-CAS that consisted of domain specification and item generation and (2) evaluation of its psychometric properties.

Development of the PC-CAS

The concept and structure of primary care competency for the Thai PC providers were explored and domains of the concept were specified. Based on the existing domains, an item pool was generated and examined by the panel of experts through three rounds of Delphi technique.

Domain specification

The domains of structural concept and their definitions of the PC-CAS were identified. By the literature reviews, five pre-specified domains, i.e., health assessment, healthcare management, integrated healthcare service, professional responsibility and communication were developed to interview guide for data collection. The data analyzed and four domains of the PC-CAS were synthesized, i.e., interpersonal relationship, care management, integrated healthcare service, and professional accountability (Table 1). The conceptualization of each domain was presented (Table 2) and its components were identified (Figure 2).

Table1

Pre-specified and Specified Domains of Primary Care Competencies.

Pre-specified domains (before interview)	Specified domains (after interview)
1. Health assessment	*1. Interpersonal relationship*
1.1 Data gathering	1.1 Communication
1.2 Screening	1.2 Coordination
1.3 Recording and reporting	1.3 Team working
1.4 Making diagnosis	1.4 Social involvement
	1.5 Collaboration
	1.6 Facilitation
2. *Healthcare management*	2. *Care management*
2.1 Strategic/program planning	2.1 Resource management
2.2 Organizational management	2.2 Environmental health management
2.3 Personnel management	2.3 Service system management
2.4 Policy development/ policy directing	2.4 Quality management
2.5 Financial management	2.5 Information management
2.6 Internal-external coordination	
2.7 Information management	
2.8 Quality improvement and risk management	
3. *Integrated healthcare service*	3. *Integrated healthcare service*
3.1 Health promotion	3.1 Health promotion
3.2 Health prevention	3.2 Disease prevention
3.3 Treatment / prescription (basic medical care)	3.3 Treatment/prescription
3.4 Health rehabilitation	3.4 Rehabilitation
	3.5 Continuing care
	3.6 Holistic care

Table 1 *(continued)*

Pre-specified domains (before interview)	Specified domains (after interview)
4. *Professional responsibility*	4. *Professional accountability*
4.1 Ethical / integrity competency	4.1 Moral sensitivity
4.2 Patient rights and professional code of ethics	4.2 Patient rights respectability
4.3 Patient advocacy	4.3 Code of ethics responsibility
4.4 Professional development	4.4 Patient advocacy
4.5 Self development and research	4.5 Professional development
4.6 Healthcare quality improvement	4.6 Self development
4.7 Healthcare quality assurance	
5. *Communication*	
5.1 Leadership	
5.2 Human relationship	
5.3 Cultural	
5.4 Community empowerment	
5.5 Professional network coordination	
5.6 Health care team participation	
5.7 Language and speech	

Primary care competency for Thai PC providers was viewed differently by the four groups of interviewees, i.e., health professional experts on primary care, director of PC providers, public health staffs, and PC providers. Professional accountability, communication, leadership, and direct care skills were expressed by the health professional experts. However, directors of PC providers viewed integrated health care services, communication, management skills, moral sensitivity, patient rights

respectability, and code of ethics as having the highest priority. Similarly, the public health staff members viewed integrated health care services, communication, management and leadership skills, and moral sensitivity as the most critical primary care competencies. Furthermore, PC providers ranked integrated health care services, communication, moral sensitivity, management skills, and self and professional development as the most crucial competencies.

Four domains of primary care competencies were synthesized from participant interviews, i.e., interpersonal relationship, care management, integrated healthcare services and professional accountability (Table 1 and Figure 2). The conceptual basis of the synthesis was presented as follows.

According to the initial conceptual, five pre-specified domains and data of interview were synthesized and formed to four domains of the PC-CAS by using the conceptual structural. Health assessment was merged with information management of care management, especially data gathering, recording and reporting. Screening and making diagnosis were combined with service system management under care management. Moreover, treatment/prescription (basic medical care) was re-arranged under the treatment/prescription subsection of the integrated health care service. Healthcare management was changed to care management. Based upon the participants' views, eight domains of healthcare management were combined into five domains of care management, making them more concise. Communication competency was changed to interpersonal relationship because the meaning of interpersonal relationship is broader than communication. The seven domains of the communication were revised to six components of the interpersonal relationship. In addition, professional responsibility was changed to professional accountability

because the accountability was also broader meaning than responsibility. Healthcare quality improvement and healthcare quality assurance were categorized into quality management under care management. Five other domains of professional responsibility were revised to be six components of professional accountability. The pre-specified domains of integrated health care service were retained, but two components (continuing care and holistic care) were added because both cares are the specific goals of the PCU's provision.

Table 2

Domains and Definitions of Primary Care Competencies.

Domains	Definitions
Interpersonal relationship	PC providers' ability in making and maintaining friendly relationships as well as ending the relationships with their patients, patients' families, communities, and colleagues constructively by using techniques of communication, coordination, team-working, social involvement, collaboration, and facilitation.
Integrated healthcare service	PC providers' provision of a broad range of services and recognition of the healthcare needs to apply or arrange its provisions when needed by health promotion, disease prevention, treatment/ prescription, rehabilitation, continuing care, and holistic care.

Table 2 *(continued)*

Domains	Definitions
Professional accountability	PC providers' performance and demonstration of professional knowledge and judgment to the public in ensuring that their practices and conducts meet legislative requirements, professional standards, and improvement. The effort attempts to maximize clients' safety and health based on moral sensitivity, patient right respectability, code of ethics, patient advocacy, professional development, and self development.
Care management	PC providers' performance in process of working and resource arranging in order to provide healthcare by utilizing resource management, environmental health management, service system management, quality management, and information management.

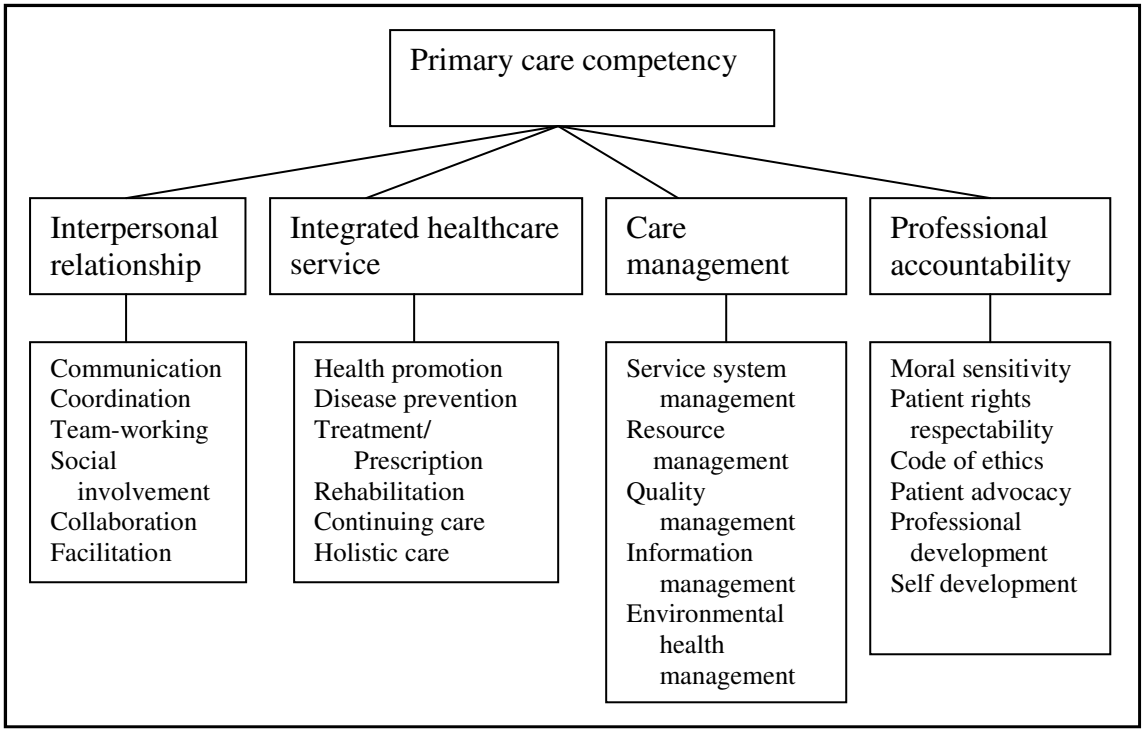

Figure 2 Domains and Components of Primary Care Competency for Thai PC Providers.

The primary care competencies' domains were prioritized based on their significance of the participant interviewees' views. The most important competency of Thai PC providers reported by all groups of the participants was interpersonal relationship. All of the informants firstly prioritized on two components, i.e., communication and team working. The results were congruent with the major role of the Thai PC providers that need to serve clients with all aged groups of patients and multidisciplinary teams. Since PC working environment requires collaboration of multidisciplinary health team, communication and team-working skills are significant for the PC providers (Boontong, 2000; Hatthakit et al., 2001; Nuntaboot, et. al., 2001; Senarattana & Kunaviktikul, 2001, cited in Tiansawad et al., 2002). Chutinuntakul (2004), Hasuwanakij (2002), Lapying and Srithamrongsawat (2003), Konggumnerd (2003) Pengpara, Jongjirasiri, and Hongsampai (2003) and Phongpipattanapan (2002)

reported that unsuccessful PC providers were caused by lacking of skills necessary for working with their healthcare teams. In addition, team-working is mentioned as the core competency of Thai civil government, and communication is valued as professional nurses' job description (Jamjuree, 2005). Furthermore, Hanucharurnkul (2003) stated that team-working, communication, and collaboration are important skills needed for advanced healthcare practice.

Collaboration was significant component of interpersonal relationship domain. In the US, enhancing health professionals' effectiveness in providing patient care was demonstrated through the collaborative approaches (Keuhn, 2004). Similarly, the Alberta Association of Registered Nurses (2000) and Nursing Council of New Zealand (2004) mentioned that the collaborative competency is important for healthcare practitioner in providing service and working within interdisciplinary health teams. In addition, the core competencies of the American family medicine consisted of communication, consulting and working with colleagues and in teams (Evans, Elwyn, & Edwards, 2004; Ramsey & Wenrich, 1999; Royal College of general practitioner, 2007). Therefore, interpersonal relationship competency was essential to the Thai PC providers.

The integrated health care service which was the second important domain was emphasized by all participants. It consisted of six components, i.e., holistic care, health promotion, disease prevention, treatment/prescription, continuing care, and rehabilitation. Health promotion and disease prevention were consistent with competencies of the US public health practitioners (Quad Council of Public Health Nurses, 2004), whereas treatment and continuing care were congruent with competencies required for the healthcare professionals in Nova Scotia and British Columbian,

Canada (2002). This is similari to competency of the American family physicians which consisted of practicing holistically and managing complexity and promoting health (Royal College of general practitioner, 2007). Those competencies were expressed on overall clinical skills (Evans, Elwyn, & Edwards, 2004; Ramsey & Wenrich, 1999).

Integrated health care service consisted of many ways of healthcare provision for all ages and groups of people. In Thailand, PC providers provide care for clients with various conditions. As a result, all dimensions of integrated healthcare service are important to the Thai PC providers (Boontong, 2001; Bureau of Nursing, 2003; Srisuphan, 2004) and that supported by the studies of Pongpipattanapan (2002) and Senarattana & Kunaviktikul (2001 cited in Tiansawad et al., 2002). However, disease prevention and health promotion were discussed by three of 26 participants that they were not well performed by Thai PC providers. The integrated healthcare service competency was significant to the PC providers. Many educational programs enhanced the PC providers who intended to improve the integrated healthcare service competency (MOPH, 2001; Showstack, Rothman, & Hassmiller, 2003).

The third significant domain of primary care competency was care management. It was indicated as needed competency for the Thai PC providers by 23 of 26 participants. It consisted of five components, i.e., service system management, resource management, quality management, information management, and environmental health management. Many evidences supported that PC providers who are highly trained in care management would manage their service system to the greatest benefit of the clients (Hattakit et al., 2001; Nuntaboot et al., 2001; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002). Service system

management was applied to provide healthcare, e.g., health, risk, illness especially chronic illness management have to be up-to-date on all of the latest discoveries (Showstack, Rothman, & Hassmiller, 2003). The resource management, quality management, information management, and environmental health management were interesting and could enhance the competency of the PC providers (Buddharo, 2002; Phusing, 2002; Thongton, 1999). The skills were proposed as significant competency for PC providers by Thailand Nursing Council (Boontong, 2001). In addition, the Canadian health professional agencies mentioned that care management skills of the practitioners are related to the administration of therapeutic and pharmacotherapeutic care, i.e., management of clients' disease, medical management, quality improvement and risk management (College of Registered Nurses of Nova Scotia, 2002; RNABC, 2003; SRNA, 2003). Similarly to the American family medicines, they have to have a high competency in clinical management and primary care administration. Therefore, the care management was important to the PC providers for arranging all resources to provide primary care.

The last domain of primary care competency was professional accountability. It was expressed by 21 of 26 participants, especially nursing experts, directors of CUPs, and PC providers. The professional accountability was composed of six components, i.e., moral sensitivity, patient right respectability, code of ethics, patient advocacy, professional development, and self development.

Professional accountability was concerned by many health professional agencies. The primary care competencies for the American practitioners and clinical specialists (The American Association of Colleges of Nursing- AACN, 2002; AACN, 2004) stated that health practitioners should commit the implementation, preservation,

and evolution of the health professional role in providing optimal care to the patient. The SRNA of Canada (2003) points out that professional responsibilities and accountabilities influence on practitioner to develop and provide quality care. Code of ethics and self development which maintains active registration as a practitioner with the health professional agency are the basis of the regulation. This is similar to practical competencies for the Thai PC providers (Boontong, 2001; Srisuphan, 2004). The RNABC of British Columbia, Canada, (2003) described that the practitioner should understand their roles and the scope of practices before they do anything. That is similar to the American family physicians who concerned themselves with humanistic quality and with maintaining an ethical approach to practice, including professionalism (Ramsey & Wenrich, 2004). A major competency and the standard of primary care services for Thai general nurses and midwives (Boontong, 2001; Srisuphan, 2004) stated that competency of PC providers include code of ethics.

The finding of conceptual structure was similarity and difference from literature reviews. It indicates that two core competencies, i.e., interpersonal relationship and professional accountability are congruent with those domains existed in national and international views, whereas the integrated healthcare service and care management are conceptually different (AACN, 2002, 2004; Boontong, 2001; Family Nurses Practitioner Association, 2004; Hatthakit et al., 2001; Nuntaboot et al., 2001; Nursing Council of New Zealand, 2004). Based on the context of Thai primary care, the domain of care management is viewed as the administrative competencies on aspects of organization, finance, information, service system, and care quality (Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002; Srisuphan, 2004). In addition, the domain of integrated healthcare service competency seems to be specific to the Thai

healthcare system in which PC providers are expected to perform all types of services (health promotion, disease prevention, treatment, and rehabilitation) that include continuing and holistic care, whereas health practitioners of other countries provide specialized care (AACN, 2002, 2004; Boontong, 2001; Family Nurses Practitioner, 2004; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002; SRNA, 2003).

The conceptual structure of primary care competency was formed with four domains. They consisted of interpersonal relationship, integrated healthcare service, care management, and professional accountability. The data from literature reviews and the expert interview were carried to develop the domain specifications which were divided into 5-6 components of each domain. The interpersonal relationship was the fist significant competency for the Thai PC providers. The communication and team-working components were also important and necessary skills for working at the PCU. The integrated healthcare service was a necessary competency which was selected by all participants. The PCUs needed competent providers to provide the integrated healthcare service for all age groups. However, only PC providers could not complete all aspects of care, thus the collaborative competency was highly needed. In addition, the care management competency was also needed for the PC providers. The first contact care by patient centered was an effective provision for the PCU including resource management, information management, and environment management were specially supported care management. The patient rights respectability, moral sensitivity, patient advocacy, and code of ethics were also necessary for the PC providers who needed training and/or continuing education anytime. Therefore, the four domains within 23 components of primary care

competencies are necessary for the PC providers who have worked at the PCUs. In the present study, items generation were conducted from these existing domains.

In conclusion, the results provided the domains and their definitions of the PC-CAS. Primary care competency for Thai PC providers were viewed differently by the four groups of interviewees. Four dimensions of primary care competencies were purposively synthesized from participant interviews and five pre-specified domains. Each domain of the primary care competencies' structure was set significant priority by the participant interviewees. Collaboration was a significant component of the interpersonal relationship domain. Integrated health care service consisted of many methods of healthcare provisions for all ages and groups of people. The third significant domain of primary care competency was care management. The last priority domain of primary care competency was professional accountability that was expressed by many health professional agencies. The finding of conceptual structure was similarity and difference from literature reviews both national and international. The conceptual structure of primary care competency was formed with four domains. They consisted of interpersonal relationship, care management, integrated healthcare services and professional accountability.

Item generation

Item pool

After the conceptual structure of primary care competency for the Thai PC providers was developed, the items of the PC-CAS were generated and validated for its content by using Delphi technique.

The conducting three rounds of Delphi technique, its results were revealed. Based on the operational definition of the identified domains and their components, 221 items were generated. Three rounds of Delphi technique involving 19, 17, and 16 panel experts were conducted. The numbers of items of 151, 114, and 81 in the # 1st, 2nd, and 3rd round had come, with 23 components and 4 domains (Table 3). In addition, each domain was prioritized by the panel of experts (Table 4 and Appendix D1). Interpersonal relationship was ranked as the first priority of primary care competency. The integrated healthcare service, care management, and professional accountability were prioritized as the # 2nd, 3rd, and 4th respectively. The orders were congruent with the three health professional experts, seven directors of CUPs, eight PC providers, and eight public health co-workers' views in the interview process.

Table3

Participants, Response, Original and Revised Items, Domains, and Components of each Round.

	1st Round	2nd Round	3rd Round
Participants (n)	21	19	17
Response (n)	19	17	16
Original items (n)	221	151	114
Revised items (n)	151	114	81
Domains (n)	4	4	4
Components (n)	23	23	23

The structure and item pool of the PC-CAS were evaluated by the experts through the three rounds of the Delphi technique. The first draft of PC-CAS included

221 items with 23 components, and four domains. In the second draft, 70 items were deleted without changing their domains and components. Even though the prioritized ranks of the factors and the components were changed by the experts' opinions in the second round, they still maintained the prioritized ranks in the final round. This round, the final draft of PC-CAS, consisted of 81 items with the same domains and components. The response rate of all rounds met the criterion consensus (more than 70%) in each round based on Sumsion's criterion (1998 cited in Hasson et al., 2000). In addition, the retention items were decided more than 51% of agreement amongst respondents based on Loughlin and Moore's criterion (1979 cited in McKenna, 1994). The greater opinion consensus is desired in the Delphi study.

The first round, domains, components, and 221-item were evaluated. The item pool was presented a matrix of four domains, i.e., interpersonal relationship, integrated healthcare service, care management, and professional accountability and the components of competency (Appendix B2). Each domain was divided into three categories, i.e., knowledge, skill, and trait. That matrix was suggested by 12 panel members to revise the matrix heading of domains to be knowledge, skill, and trait; each heading consisted of four domains of primary care competency: interpersonal relationship, integrated healthcare service, care management, and professional accountability (Appendix B3). Initial items consisted of knowledge # 66, skill # 97, and trait # 58. Seventy items were deleted and 42 items were revised because of several reasons such as items of knowledge and trait were ambiguous, redundant, irrelevant, complex, double barreled and impractical. This was congruent with sound items' criterion according to what DeVellis (1991) and Waltz, Strickland, and Lenz (1991, 2005) presented. Seventy items of the first draft that received less than 51%

agreement were deleted. Forty-two items were revised based on the recommendations of the panel of experts. This resulted in retaining 151 items that formed the second draft and was sent to the same experts (Figure 1). The kept items were the item of knowledge # 49 items, skill # 63 items, and trait # 39 items.

The second round, the results showed that 114 of 151 items were retained with validity of domains and components. The 151 items (the 2nd draft) were revised by the same experts. Some items of knowledge and trait were still unclear and redundant. Four experts mentioned that the knowledge items did not quite represent the knowledge required for performing primary care services. Also, trait items did not portray primary care providers' personalities. Only the skill items were clear. The domains and components of the PC-CAS were prioritized by the experts. The significances of the factors were considered by using mode statistic. The results revealed more than one score of mode or number cases (N) of mode was less than 50 % thus, the priorities could not be determined. Therefore, the statistics of mode, median, mean, standard deviation, and inter quartile range (IQR) were used to help making decisions, i.e., (1) the highest mode was selected when N was more than 50%, (2) if the highest mode with N was less than 50%, the median and IQR which were close to mode score were considered, and (3) if median and mode of the 1st and 2nd were not close, the mean and SD were taken into consideration. The value of mode, median, and mean are the same value or so close to one another indicates that the data is the best range (Munro, 2001). The priority results of the PC-CAS's domains are presented in Table 4 while the priority results of its components can be seen in Appendix D1. Furthermore, 37 items which consisted of 14 knowledge items, 13 skill items, and 10 trait items were deleted due to unpractical, while other 114 items were

retained and formed the 3rd draft of the PC-CAS items. They were revised based on the experts' suggestions and were re-sent to the same experts for continuing process of the third round.

In the third round, the results of domains and components' priorities confirmation were revealed together with 81 retained items. Sixteen (94.12%) experts' responses were returned, 81 items (16 knowledge items, 43 skill items, and 22 trait items) were retained as the final draft of PC-CAS items of the Delphi study. Sixteen items which had a redundant meaning of "knowledge items" and "skill items" were deleted. In addition, seventeen items with the score less than 50 % were also discarded because they were still unclear and impractical. Fourteen of sixteen panel members confirmed the first decision regarding the priority of the PC-CAS's components. One expert reported that because social involvement, collaboration, and facilitation had all the same meaning, the priorities should thus be at similar level. The consensus resulted of the prioritized domains of the primary care competency was still similar to the second-round results in the first and the second priority while the third and the fourth priorities were changed (Table 4).

Table 4

Mode, Mean, Median, Percentage of the Experts' Consensus Score and Priority of the PC-CAS' s Domains.

The domains	Delphi 2					Delphi 3				
	Mode (N)	Mean (SD)	Median (IQR)	%	Priority	Mode (N)	Mean (SD)	Median (IQR)	%	Priority
Interpersonal relationship	1 (7)	2.18 (1.13)	2.00 (2.00)	41.2	1	1 (10)	1.94 (1.44)	1 (2.00)	62.5	1
Integrated healthcare service	2 (12)	1.88 (0.53)	2.00 (1.00)	70.6	2	2 (11)	1.69 (0.48)	2.00 (1.00)	68.8	2
Professional accountability	4 (6)	2.76 (1.20)	3.00 (2.75)	35.3	3	4 (10)	3.56 (0.63)	4.00 (1.00)	62.5	4
Care management	4 (8)	2.82 (1.33)	3.00 (3.00)	47.1	4	3 (6)	2.94 (0.93)	3.00 (2.00)	37.5	3

The interpersonal relationship was the first priority because it is an initial quality for establishing an effective and a collaborative working environment. Sound communication between PC providers and clients could positively influence the efficiency of PCU's provision. This result supports the major role of the Thai PC providers who serve clients with all age groups and collaborate with multidisciplinary teams. Since PCU working environment requires collaboration with multidisciplinary health team, the communication and teamwork skills are significant for the PC providers as previously mentioned on the domains specification part. Being seen as the most significant competency, the interpersonal relationship is thus pointed out as the initial qualified ability for the PC providers by both teams of the expert panel as per finding through the interview and Delphi technique methods. In addition, the

priority rankings of its components were similarly identified by the two previous groups of experts. The communication was the first priority, then team-working, coordination, social involvement, collaboration, and facilitation came respectively (Appendix D1). They consisted of 3 knowledge items, 7 skill items, and 10 trait items.

Integrated healthcare service was the second priority. The components of the integrated healthcare service are the major rules and responsibilities that the PC providers must provide for all groups of people. The finding is congruent with the panel of experts' opinions and all participants' expression through the interview based on the fact that PC providers provide care to clients with various conditions. All components of integrated healthcare service are important to the Thai PC providers (Boontong, 2001; Pongpipattanapan, 2002; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002; Srisuphan, 2004). Holistic care was the first priority component of integrated healthcare service because it was the primary care goal. The second and the third priority were healthcare promotion and disease prevention. Hence, the first healthcare provision goals that can relieve the healthcare cost and sustain the people's health is primary care service (Health Service Network Development Institute, 2003; Yengkratok, 2001). The experts ranked treatment as the fourth priority although PC providers spend most of their time performing treatments at work. The continuing care and rehabilitation were also deemed as important by the PC providers because they are among the key components of healthcare provisions' goals. In conclusions, all components of integrated healthcare service are important to the primary healthcare provision. Therefore PC providers should be competent on these aspects. Integrated healthcare service consisted of 4 knowledge items, 16 skill items, and 4 trait items.

The third priority was care management as it was viewed as a leading factor to establish an effective management and, ultimately, quality services. The care management could point out the best direction at work. The care management was indicated the needed competency by 23 of 26 the Thai PC providers through the interview method. The evidences supported that the PC providers who are highly trained in care management would be able to manage a provision system for the greatest benefit of the clients (Hattakit et al., 2001; Nuntaboot et al., 2001; Senarattana & Kunaviktikul, 2001 cited in Tiansawad et al., 2002). The management skill was proposed as significant competency for PC providers by Thailand Nursing Council (Boontong, 2001). In the Delphi study, care management was ranked as the third priority of primary care competency for the PC providers. Its components, service system management was ranked the first priority, and the resource management, quality management, information management, and environmental health management were prioritized as the second to the fifth respectively. The available conducting resources are expected to be performed by PC providers by using assessment, planning, implementation, and evaluation. In addition, other tasks such as information management, the application of human resources in order to provide cost-effective care, quality improvement and risk management are also included. The care management competency for the Thai PC providers is assumed to be in tune with the care management skills of the Canadian health professional agencies especially on the aspect of management of clients' disease, medical management, quality improvement and risk management (College of Registered Nurses of Nova Scotia, 2002; RNABC, 2003; SRNA, 2003). Care management consisted of 4 knowledge items, 10 skill items, and 4 trait items.

The fourth priority was professional accountability. The panel of experts proposed that the PC providers should possess a high level of professionalism before they do anything. Good services have been given by the PC providers indicating a good level of professional values and responsibilities. This finding was congruent with the expression by 21 of 26 experts in the interview process. The patient rights was the first prioritized domain while code of ethics, moral sensitivity, patient advocacy, self and professional development came in second to sixth priority respectively. The primary care provision goals emphasized a patient centered approach thus the patient rights is important to the PC providers (Bureau of Nursing, 2003). The healthcare providers especially the PC providers should commit to moral sensitivity, code of ethics, and patient advocacy (Boontong, 2001; Srisuphan, et al., 1999). In addition, the standards and/or quality improvement are trend of all services. Therefore, the PC providers should continuously improve themselves to further develop the PCU and ultimately achieve its institutional goals. Professional accountability consisted of 5 knowledge items, 10 skill items, and 4 trait items.

The PC-CAS is an instrument which represents comprehensive description of primary care goals at PCU. The intervention directed toward individuals, families, community, and systems involve the overall competency. The content validity of PC-CAS is endorsed by three rounds of consensus among nationally-known experts. Assessment of content validity requires analysis of the items to assure the inclusion of important primary care competency concept. In addition, the criterion validity of the PC-CAS was tested because of the expert reviewers of the Delphi technique. The cutout of PC-CAS's items was based on norm validity as it is a common belief that every PC providers would be competent but those competencies could not be a cut out by criterion

levels until construct validity was tested. The PC-CAS was started with 221 items (66 knowledge items, 97 skill items, and 58 trait items) whereas, the end of third round consisted of 81 items (16 items of knowledge, 43 skill items, and 22 trait items).

Scale format determination

The best of the PC-CAS's format was determined. A 6-point rating scale format was conducted to measure to what extent the knowledge, skills, and traits of primary care competency for PC providers earn or perform to provide care for their populations. Based on the following:

The "knowledge" refers to measurement of specific knowledge that PC providers earn to provide care at PCU.

The "skill" refers to measurement of specific skills that PC providers have practiced for PCU work.

The "trait" refers to measurement of significant individual personality of PC providers at work.

The descriptor of rating scale ranges from 0 to 5, "0" means "disagree" or "not true at all" or "never performed" to "5" which means "strongly agree" or "extremely true" or "always performed" (Figure 3).

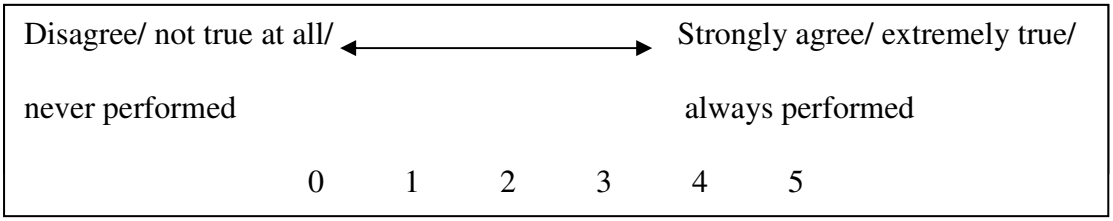

Figure 3 The Scale Format of the PC-CAS.

The 6-point rating scale format was selected to avoid a neutral and ambivalent midpoint. Therefore, the rating scale on six choices would contribute to less bias of an answer than a tool with odd numeric choices whose mid-point was often chosen (Jones & Kay, 1992). The PC providers whose competency being assessed can select the choices of the rating scale and obtain autonomous answer by themselves.

In conclusion, according to three rounds Delphi technique was conducted, its results were revealed. The structure and item pool of the PC-CAS were evaluated by the experts through the three rounds of the Delphi technique. The first round, domains, components, and 221-item were evaluated. In the second round, the results showed that 114 of 151 items were retained with significant priority domains and components. In the third round, the results of domains and components' priorities were confirmed and 81 retained items were revealed. The interpersonal relationship was the first priority because it is an initial quality for establishing an effective and a collaborative working environment. Integrated healthcare service was the second priority. The third priority was care management as it was viewed as a leading factor to establish an effective management and, ultimately, quality services. The fourth priority was professional accountability. The PC-CAS is an instrument which represents comprehensive description of primary care goals at PCU. The best of the PC-CAS's format was determined. The 6-point rating scale format was selected to avoid a neutral and ambivalent midpoint.

In the phase I: development of the PC-CAS, there were four domains of the PC-CAS, i.e., interpersonal relationship, integrated healthcare service, care management, and professional accountability. Each domain consisted of five to six components. The initial 221 items were generated and examined by 21 experts in three rounds of the

Delphi technique. The PC-CAS items that resulted in 151, 114, and 81 respectively were retained at the end of each round. The pre-final draft of 81 items were kept in the international relationship (22 items), integrated healthcare service (20 items), care management (17 items), and professional accountability (22 items). The PC-CAS, 81-item was to test further their psychometric properties in the second phase.

Psychometric evaluation

The psychometric evaluation was used to evaluate the level of reliability and validity. The test-retest was used to test stability of PC-CAS's reliability whereas Cronbach's alpha coefficient was used to test its internal consistency. For content validity, the Content Validity Index (CVI) was calculated from four experts, i.e., three health professional experts and one physician who had expertise in primary care. The hypothesis testing approach, item analysis, and confirmatory factor analysis (CFA) were used to evaluate the construct validity. The findings of psychometric testing are presented below.

Validity

Content validity

Eighty one items of PC-CAS was reviewed by four experts (Appendix E). According to the experts' review, 16 irrelevant items were deleted and resulted in 65 - item PC-CAS. Detailed descriptions of this step were as follows:

1) Item relevancy: The Content Validity Index (CVI) was 0.80 (80.24 %). This means that the four experts agreed that 80.24 % of the primary care competency was quite relevant or very relevant to the objectives of the instruments. Major change was

recommended by the experts. Sixty five items were kept and 16 irrelevant items were deleted because of having the same meaning (Appendix D4). Therefore, the CVI of 0.80 indicated acceptable relevancy to the content of primary care competency based on Waltz and Bausell (1981 cited in Lynn, 1986) and Waltz, Strickland, and Lenz (1991).

2) Item redundancy: Twenty nine items were decided to be redundant. The 22 items of 29 redundant items were kept because they were acceptably relevant items.

3) Item clarity: Twenty eight items were unclear, 25 items were revised (Appendix D3). Only three items were deleted as presentation in Thai language:

"ใช้ทรัพยากรต่างๆ ด้วยความโปร่งใส พร้อมต่อการตรวจสอบทุกเมื่อ"
"มุ่งมั่นพัฒนาประสิทธิภาพของงานให้เกิดผลสูงสุด"
"กระตือรือร้นในการนำความรู้ใหม่ ๆ มาใช้ในงาน"

It was suggested to have the contents of the items revised because they were not clear. One expert suggested that dimension of "interpersonal relationship" should be reworded from "noun statement" to "verbal statement." Some examples of the revised PC-CAS items in Thai language were presented in the Figure 4.

Example # 1	
Original statement	การให้ความรู้ด้านสุขภาพแก่ผู้ใช้บริการPCUจำเป็นต้องใช้วิธีการสื่อสารหลากหลายรูปแบบ
Revised statement	ให้ความรู้ด้านสุขภาพ แก่ผู้ใช้บริการ PCU ต้องใช้วิธีการสื่อสารหลากหลายรูปแบบ *"To provide health care information to those utilizing PCU services requires a variety of communication methods"*
This statement was changed from "noun statement" to be "verbal statement" which presented its activity and then it was restated by deleting the redundant word.	
Example # 2	
Original statement	การร่วมค้นหารับรู้ปัญหาและความต้องการของชุมชนเป็นสิ่งจำเป็นในงาน PCU
Revised statement	ร่วมค้นหา รับรู้ปัญหาและความต้องการของชุมชนในงานที่ทำ *"To investigate and understand the problems and needs of the community in the PCU work."*
This statement was similar to the example # 1 that was changed from noun statement to verbal statement and reworded.	
Example # 3	
Original statement:	การเสริมสร้างพลังอำนาจให้คนดูแลสุขภาพด้วยตนเองเป็นการสร้างเสริมสุขภาพที่ยั่งยืน
Revised statement:	เสริมสร้างพลังอำนาจให้คนดูแลสุขภาพด้วยตนเอง *"To empower people to perform self-care practice."*
This statement was changed from noun to verbal statement and the redundant word was deleted.	

Figure 4 The Examples of the Revised PC-CAS Items.

In summary, in the set of 81 items, 65 items were retained and needed some revision to reduce their redundancies. Acceptable content validity, the CVI was 0.80. Thus, 65-item, the final draft of the PC-CAS was used for the next step. The final

draft of the PC-CAS, 65-item consisted of 11 knowledge items, 41 skill items, and 13 trait items. Most of the PC-CAS items were skill items which indicated that the experts needed specific skills of PC providers more than knowledge and trait. The skill items were tangible demonstration and evaluation of the primary care competency more than knowledge and trait. Therefore, the 65-item of the PC-CAS did not present the knowledge and trait items distinctly.

Construct validity evaluation

Hypothesis testing, item analysis, and confirmatory factor analysis (CFA) were used to test the PC-CAS's construct validity. The results will be presented in the following order: (1) sample characteristics, (2) item analysis, (3) CFA, and (4) hypothesis testing.

Characteristics of the samples

In order to examine construct validity of the PC-CAS, a sample of 419 PC providers was involved. The PC providers consisted of 360 full-time PC providers and 59 part-time groups who have been working at PCUs more than one year. The samples were selected by using the cluster random sampling technique from the five regions of Thailand (Appendix C). The demographic characteristics of the subjects are presented in Table 5.

The age of the PC providers ranged from 22 to 58 years, with a mean of 36.12 years (SD = 6.86). The duration of primary care experience ranged from 2 to 34 years, with a mean of 6.32 years (SD = 5.65). The duration of the PCU employment ranged from 2 to 34 years, with a mean of 4.18 years (SD = 3.97). The minority were part-

time PC providers (14.10 %, n = 59), and almost half were working at PCU at least 2 days a week (2-3 days per week) (33.89 %, n = 20). Most of the PC providers (73.30 %, n = 307) received training courses and 67.10 % (n = 206) had 4 month of NP training. In addition, most of the PC providers (63.00 %, n = 264) had worked at community hospitals.

Table 5

Demographic Characteristics of the PC Providers (N = 419).

Demographic characteristics	Mean	SD	Frequency	Percentage
Gender				
Male			16	3.80
Female			403	96.20
Age	36.12	6.86		
Religion				
Buddhist			399	95.20
Muslim			18	4.30
Christian			2	0.50
Marital status				
Single			102	24.30
Married			296	70.60
Widowed, Divorced, Separated			21	5.10
Education level				
Bachelor degree			387	92.40
Master degree			32	7.60
Duration of primary care experience	6.32	5.65		
Duration of primary care experience	6.32	5.65		
Duration of the PCU employment	4.18	3.97		

Table 5 *(continued)*

Demographic characteristics	Mean	SD	Frequency	Percentage
Working status				
Full-time			360	85.90
Part-time			59	14.10
Part-time criterion: Schedule			36	61.02
Few days a week			20	33.90
Up to schedule of work			16	27.12
Part-time criterion: Occasion			23	38.98
Provider's shortage			17	28.81
Specific clinic/program			6	10.17
Primary care training				
Completed			307	73.30
None			112	26.70
Course of training				
4 months of NP			206	67.10
1-2 months of NP			12	3.90
1-2 weeks of NP			47	15.30
Other: PCU' s management			42	13.70
Past working experiences				
Community hospital			264	63.00
General hospitals/medical center hospitals			60	14.30
University hospital			1	0.20
District/provincial/city hall health center			40	9.50
None			105	25.10

Item analysis

The item analysis of PC-CAS is presented in Table 8 and Appendix D4. The correlation between item and component (item-total) will be presented how competency items (CPs) respond to each component, how each component relates to domain, and how each domain relates to the PC-CAS. The correlations of item-total of each domain were high ($r = 0.86 - 0.93$, $p < 0.01$) while the correlations between component and domain (item-total) were moderate to high level ($r = 0.67 - 0.85$, $p < 0.01$). Based on Nunnally and Bernstein (1994), the results of the correlation between item and total (item-component, component-domain) of the domains were more than 0.50 indicated that well associated items within components, and well components belonged to domains hence they were well items, components, and domains within the PC-CAS. The correlations between item-total (components-domains, items-components) were moderate to high (Appendix D4). While, the correlation among items (between item and item, component and component, and domain and domain) the expected results should be low (Nunnally & Bernstein, 1994). But those correlations were moderate to high as can be seen in the Table 6 and Appendix D4.

Table 6

Total -Domains Correlation.

PC-CAS	1.	2.	3.	4.
1. Interpersonal relationship	1.00			
2. Integrated healthcare service	0.85	1.00		
3.Care management	0.76	0.73	1.00	
4. Professional accountability	0.72	0.71	0.67	1.00
Total	0.93	0.91	0.88	0.86

Note. All significant correlations at $p < 0.01$ (2-tailed)

The high correlations between item-item, component-component, and domain-domain indicated they were redundant or that they overlapped (Nunnally & Bernstein, 1994). The correlation between integrated healthcare service and interpersonal relationship was high ($r = 0.85$, $p< 0.01$) and care management and interpersonal relationship was (high) moderate ($r = 0.76$, $p < 0.01$) while care management and professional accountability was moderate ($r = 0.67$, $p < 0.01$). The high and (high) moderate correlation indicated that their items would overlap. Therefore, they needed to be asked repeatedly or be deliberately reconsidered in the further test. While moderate correlation indicated that those items would present some redundancy or overlap, but they could be used. Further those items should be asked repeatedly and reconsidered their correlations again.

The findings indicated that the correlations between item-total (item-component, component-domain) were acceptable relationships. All items-components and components-domains were appropriate associations but the relationships among items (each component and each domain) were not very satisfying. Low relationships were expected but they were moderate to high. The finding indicated that some items, some components and domains could be redundant or could have overlapped. Hence, any item that failed to correlate with the relevant score was carefully inspected. They would be further explored to find suitable components and domains to which they belonged. In the present study, the confirmatory factor analysis was used to analyze those items and components in the final steps.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) determines how well the PC-CAS model fit the data. Each model of PC-CAS domains was modified by using LISREL program. Five steps of the modification process were reported in the previous chapter. The model of integrated healthcare service, care management, professional accountability, interpersonal relationship, and the PC-CAS will be presented.

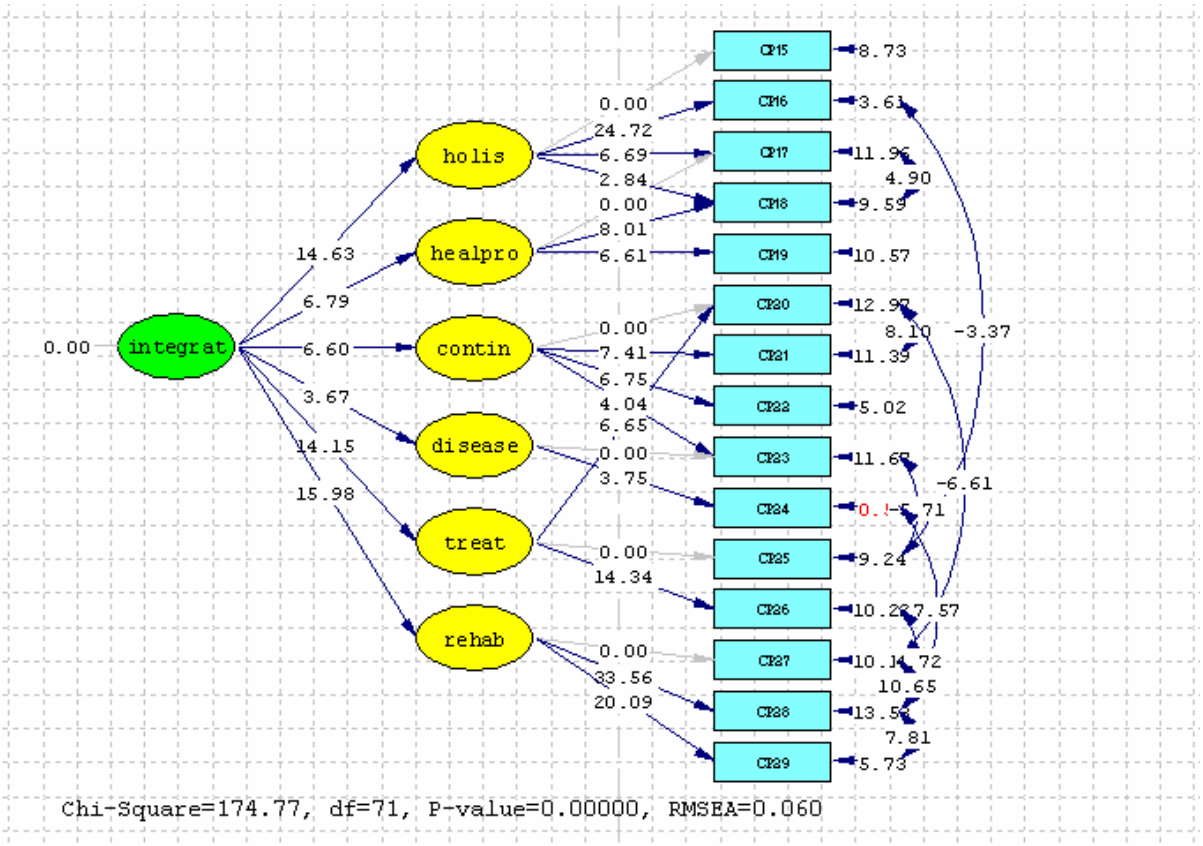

Figure 5 The Final Model of Integrated Healthcare Service.

Note. integrat = integrated healthcare service, holis = holistic care, healpro = health promotion, contin = continuing care, disease = disease prevention, treat = treatment/prescription, and rehab = rehabilitation

The Figure 5 showed the association between integrated healthcare service, its components, and its items. As seen in Figure 5, the 6 factors of integrated healthcare service consisted of 15 items (CP15 - CP29). The intercorrelations among items were identified by arrows; the numbers on each arrow represented the estimated correlation among them. The single-headed arrows leading from the eclipses to the boxes suggested the regression of item scores on each factor. The numbers on each arrow represented the estimated regression weights (factor loading) and t values. The boxes with pale arrows and no arrows indicated non-significant correlation ($t < |2|$). The circles with single-headed arrows indicated random measurement error that had some

bearing on the reliability of the observed variables (item CP15 to CP29) in their measurement of the underlying factors. In those models, there were negative intercorrelations among measurement error. In addition, each item was explained by one factor. The fit indices of this model among the items, domains and components are presented in Table 7.

Based on the results, the six components were used as indicators for the construct of the integrated healthcare service. It should be noted that the direction of the factor loading for the holistic care, health promotion, continuing care, disease prevention, treatment, and rehabilitation was positive. An interpretation of the relationship of this construct model with other constructs must be based on the underlying direction of each component.

Model of integrated healthcare service, initial-order model was performed. The six components: (holistic care, health promotion, continuing care, disease prevention, treatment, and rehabilitation) were latent variables; and 15 items (CP15 – CP29) were the observed variables. Each component had its associated indicators originally proposed. The finding from the first-order model confirmed that all items under the six components of the integrated healthcare service had well to excellent factor loadings and the percentage of variance in each item was adequately accounted for by the variance in its latent construct. And also the six components were the observed variables of the integrated healthcare service domain in the model (Figure 4). The fit indices outputs were presented after initial model were conducted. Chi-Square = 1242.96 (df = 90, P = 0.00), RMSEA = 0.21, NFI = 0.85, NNFI = 0.84, CFI = 0.86, GFI = 0.62, AGFI = 0.49, and RMR = 0.37 were interpreted. The results indicated that the model did not fit the data very well. Therefore, the initial model was

re-specified (substitute particle please) the path models until the results of fit indices were acceptable. The last modification of the integrated model, the factors loading and t values ranged from r = 0.39 to 0.91 and t = 3.75 to 24.72 (Appendix D5 & Figure 5). Three items (CP15, CP25 and CP27) should be dropped because the t values were less than |2| indicating non significant correlation (Stevens, 2002; Tabachnick & Fidell, 2001). In addition, based on item analysis, the CP15 and CP27 which had high correlations among items were ambiguous. They should be dropped although the CP27 had a high correlation with the rehabilitation ($r = 0.88$, $p < 0.01$) whereas the CP15 had moderate correlation with holistic care ($r = 0.68$, $p < 0.01$). However, the CP15 and CP25 were not deleted because they affected the construct validity. Therefore, the CP15 and CP25 were kept on the holistic care and treatment/prescription. Only the CP27 was dropped out because it could not predict the criterion of the model. Two items (CP17 and CP20) were not significant ($t < |2|$) for their components (health promotion and continuing care) but they were significant ($t > |2|$) for holistic care and treatment. They were kept on new components (holistic care and treatment) but they were still with integrated healthcare service model. The final integrated healthcare service model within 6 components and 14 items fit the data well (Figure 5). The fit indices of the model are presented in Table 7.

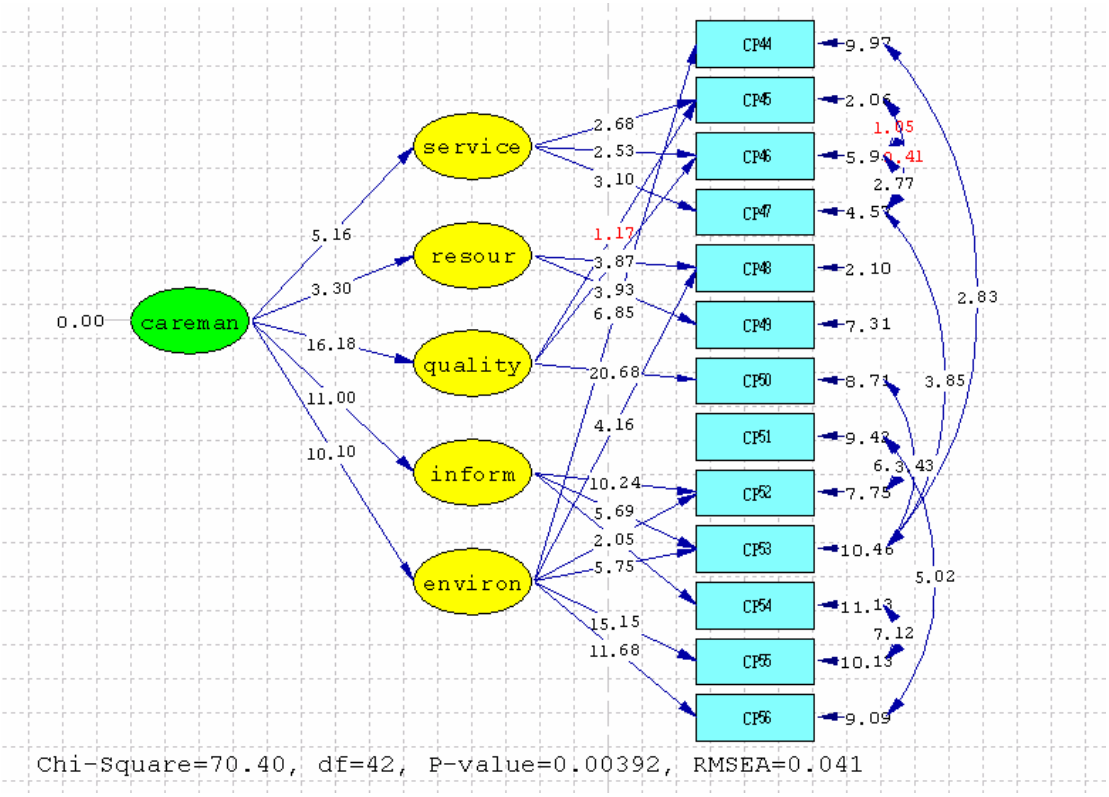

Figure 6 The Final Model of Care Management.

Note. careman = care management, service = service system management, resour = resource management, quality = quality management, inform = information management, and environ = environmental health management

The model of care management, 13 items (CP44 – CP53) were the observed variables and five components (service system management, resource management, quality management, information management, and environmental health management) were latent variables and also observed variables of the care management domain. The fit indices of the initial model did not indicate that the model fitted well to the data by Chi-Square = 1583.77 (df = 65, P = 0.00), RMSEA = 0.25, NFI = 0.82, NNFI = 0.79, CFI = 0.83, RMR = 0.30, GFI = 0.58, and AGFI = 0.42. After the model specification was re-modified the fit indices statistics showed that the model fitted well with the data as presented in Table 7. The factors loading of the final care management model ranged from r = 0.10 to 0.92, and t values ranged

from t = 0.00 to 16.18 (Appendix D5 & Figure 6). Three items (CP49, CP51 and CP54) were dropped because they were not significant (t < |2|) (Stevens, 2002; Tabachnick & Fidell, 2001). They were not an effect on the content validity because they might be ambiguous which highly correlated among items by item analysis (r = 0.79, 0.68, 0.74, p < 0.01) (Appendix D4). In addition, the CP49 and CP54 had significant correlations with the resource management and the information management but they still were rejected because their factor loading was less than 0.30 (t = 3.93, r = 0.15; t = 2.05, r = 0.10). The two items (CP44 and CP47) lacked significant correlation with their own components (service system management and resource management) but they were significantly correlated with the environmental health management and resource management including factor loading higher than 0.30.

In addition, by giving consideration to the estimated predictors as seen in Figure 5, some items belonged to more than one component such as the pair of CP46 and quality management (t = 2.53, r = 0.51), CP48 and environmental health management (t = 4.15, r = 0.24), CP52 and environmental health management (t = 2.05, r = 0.30) and finally CP53 and environmental health management (t = 5.75, r = 0.39). As per the evidences, the pairs of the intercorrelations (factor loading) larger than 0.30 (r > 0.30) were reconsidered and readjusted (Figure 6).

Therefore, the care management model fit the data although three items (CP49, CP51, and CP54) were dropped because they could not predict its components as can be seen in Figure 6. As for the model with significant parameter estimates, its statistical goodness of fit indices was acceptably fit (Table7).

The model of professional accountability had 19 items (CP30 – CP43, CP57-CP60, and CP65) as the observed variables and 6 components (moral sensitivity, patient rights respectability, patient advocacy, code of ethics, professional development, and self development) as the latent variables as well as the observed variables of the professional accountability domain. This model was the same as the previous model. The fit indices statistics of the initial modification did not fit very well to the data. The Chi-Square = 14118.51 (df = 152, P = 0.00), RMSEA = 0.20, NFI = -0.44, NNFI = -0.63, CFI = 0.00, RMR = 8.31, GFI = -2.23, AGFI = -3.04, and PGFI = -1.79 were revealed. Re-specification of the professional accountability model was then performed with the fit indices result of the last model in Table 7. The factors loading and t values ranged from r = 0.28 to 1.00 and t = 2.08 to 10.84 (Appendix D5 & Figure 7). Three items (CP34, CP38 and CP59) should be dropped because the t values had not significant correlation which indicated that they were not significant predictors of their components (Stevens, 2002; Tabachnick & Fidell, 2001). The correlation between the CP38 and self development and the CP59 and moral sensitivity were high and moderately correlated ($r = 0.82, 0.70, p < 0.01$). The CP34 was only one item of patient advocacy. It had an effect on the content and construct validity of the PC-CAS when it was deleted while the CP38 and CP59 were not. In addition, nine items (CP30, CP33, CP35, CP36, CP37, CP40, CP57, CP58 and CP65) had non significant correlation with their own components but they were significantly correlated with the others as presented in Figure 7.

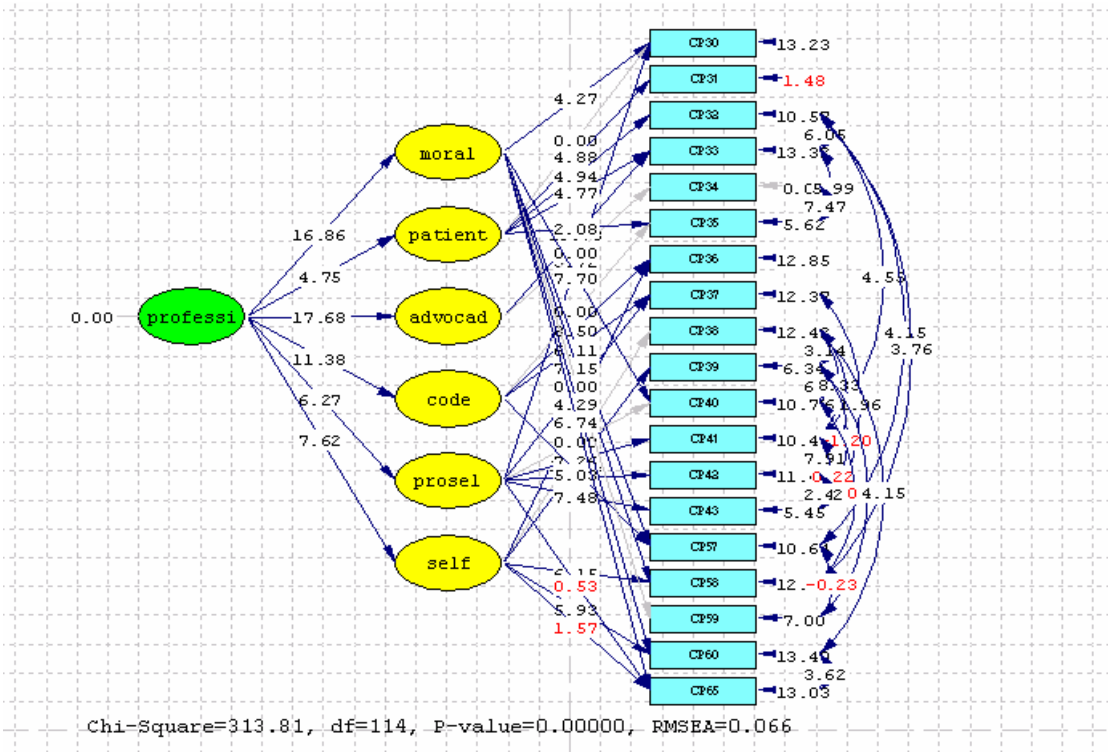

Figure 7 The Final Model of Professional Accountability.

Note. professi = professional accountability, moral = moral sensitivity, patient = patient rights respectability, advocad = patient advocacy, code = code of ethics, prosel = professional development, and self = self development.

Figure 7 demonstrates that many items could be related to more than one component, i.e., CP30 and moral sensitivity (t = 4.27, r = 0.31), CP30 and professional development (t = 5.72, r = 0.30), CP33 and patient advocacy (t = 10.78, r = 0.37), CP35 and patient rights respectability (t = 2.08, r = 0.11), CP36 and self development (t = 4.60, r = 0.26), CP37 and professional development (t = 4.28, r = 0.25), CP40 and moral sensitivity (t = 7.70, r = 0.45), CP57 and moral sensitivity (t = 6.11, r = 0.47), CP58 and moral sensitivity (t = 7.15, r = 0.43), CP65 and self development (t = 1.57, r = 0.27), and CP65 and professional development (t = 0.53, r = 0.09). As shown by the evidences, the pairs of the intercorrelations of more than 0.30 were reconsidered.

The professional accountability model was thus designed to fit the data although two items (CP38 and CP59) were dropped as can be seen in Figure 7. The model with significant parameter estimates and the statistical goodness of fit indices was acceptably fit (Table 7).

The model of interpersonal relationship, 18 items (CP1 – CP14 and CP61 - CP64) were the observed variables, and six components (communication, coordination, team-working, social involvement, collaboration, and facilitation) were the latent variables and also the observed variables of the interpersonal relationship domain. It was similar to all models as previously presented. The initial model could not fit very well into the data by the results of Chi-Square = 1853.53 (df = 135, P = 0.00), RMSEA = 0.20, NFI = 0.82, NNFI = 0.81, CFI = 0.83, RMR = 0.35, GFI = 0.59, AGFI = 0.48, and PGFI = 0.46. Then, re-specification of this model was performed with the last result shown in Table 9. The factors loading and t values ranged from r = 0.37 to 0.88, and t = 2.54 to 26.83 (Appendix D5 & Figure 8). Based on the finding, four items (CP7, CP10, CP11 and CP14) should be dropped because their t values were less than two which indicated that they were not significantly correlated to those components (Stevens, 2002; Tabachnick & Fidell, 2001). As for the results of the item analysis results, their correlations between item-component were moderate to high (r = 0.84, 0.78, 0.87, and 0.78, $p < 0.01$). The CP7 could not be rejected because content validity was affected whereas other did not. The results showed that four items (CP1, CP5, CP8 and CP9) were significantly correlated with other components though they were not correlated to their own factors (Figure 8).

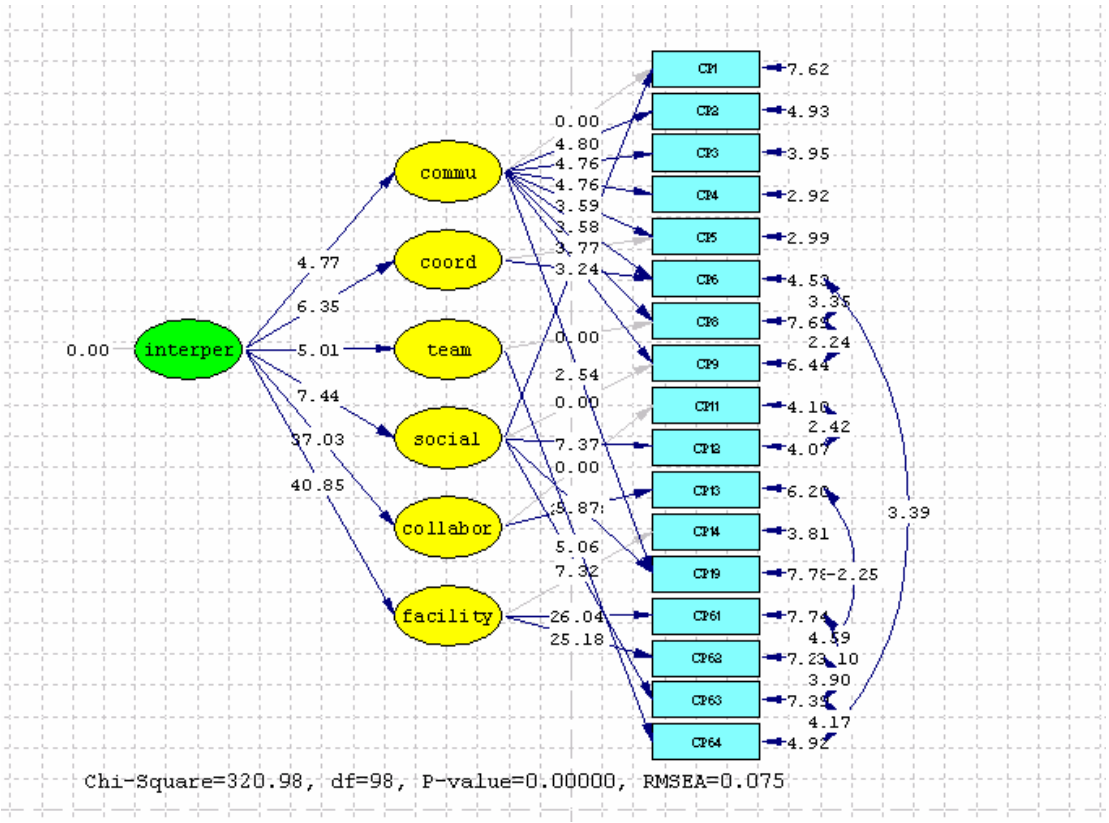

Figure 8. The Final Model of Interpersonal Relationship.

Note. interper = interpersonal relationship, commu = communication, coord = coordination, team = team-working, social = social involvement, collabor = collaboration and facility = facilitation

The interpersonal relationship model fits into the data (Figure 8). The Maximum Likelihood (ML) estimation method could produce the initial model but the results of fit indices did not fit very well like the results that were previously presented. The respecification of the models could not modify with ML estimation method because of the effect on non positive results. Hence, Unweighted Least Squares (ULS) estimation method was used to estimate these parameters because the ULS estimation method was more suitable than ML with semidefinited or nondefinited covariance matrices which were detailed in Appendix F. In addition, the Chi-square, standard errors, t values and standardized residuals in ULS were calculated under the assumption

of multivariate normality. The goodness of fit indices statistics of the final model indicated that the model fits the data as presented in Table 7.

In addition, as seen in Figure 8, the finding showed that some items could be significantly correlated with more than one component, i.e., CP1 and social involvement ($t = 4.59$, $r = 0.36$), CP5 and communication ($t = 3.59$, $r = 0.33$), CP6 and communication ($t = 3.58$, $r = 0.37$), CP8 and communication ($t = 3.77$, $r = 0.34$), and CP9 and communication ($t = 3.24$, $r = 0.28$). Furthermore, the CP19 of health promotion in the integrated healthcare service had significant correlation with the communication ($t = 2.54$, $r = 0.20$). As shown by the evidences, the pairs of the intercorrelations greater than 0.30 were readjusted.

Therefore, the interpersonal relationship model is determined to fit the observed data. Although the four items (CP9, CP10, CP11, and CP14) were dropped they were still involved with the model. However, were not used to predict their components. The retained items of all components were presented to fit the data. Therefore, the interpersonal relationship model of the PC-CAS fit the data based on the fit indices which can be seen in Table 7.

Table 7

Fit Indices of CFA models (N = 407).

Fit Index	Acceptable Values	Integrated health care service	Care management	Interpersonal relationship	Professional accountability	PC-CAS
Chi-square	At least Non Sig.	147.77 p = 0.000*	70.40 p = 0.003*	320.98 p = 0.000*	313.81 p = 0.000*	4.76 p = 0.09
Degree of freedom (df)	-	71.00	42.00	98.00	114.00	2.00
χ^2 / df	< 3.00	2.46	1.67	3.27	2.75	2.38
Goodness of Fit Index - GFI	> 0.90	0.95	0.97	1.00	0.92	0.99
Adjusted Goodness of Fit Index - AGFI	> 0.80	0.91	0.94	0.99	0.87	0.97
Comparative Fit Index - CFI	> 0.90	0.99	1.00	1.00	0.99	1.00
Root Mean Square Error of Approximation - RMSEA	< 0.08	0.06	0.04	0.07	0.06	0.05
Standardized root Mean Square Residual (RMR)	< 0.05	0.03	0.02	0.03	0.04	0.01

* Significance

The results as seen in Table 7 indicated that the model fit the data (n = 407). All fit indices were acceptable but exceptionally significant Chi-square values. Because of characteristic of the Chi-square, its value was significant result when it was tested with large sample size (Stevens, 2002).

The model of fitting and the factor loading of each PC-CAS domain is presented in the Figure 5-8. In the model, the items were allowed to load only the factor on which they were written to measure. The relationships of the observed variables and latent variables were presented. All factors were hypothesized to correlate with initial-order and second-order model including the final model (Figure 9).

After items were confirmed to fit into each component, the second respecification, in which 23 components were the observed variables and latent variables were composed of 4 domains. The third remodified consisted of 4 observed variables, and the PC-CAS was a latent variable. The final results of this run are presented in Figure 9 and Table 7.

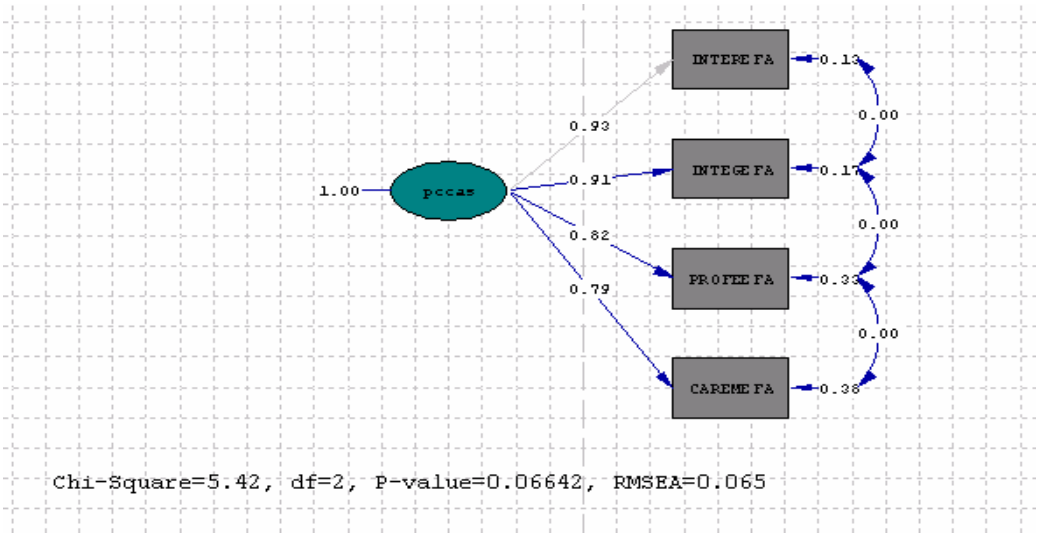

Figure 9 The Final Model of PC-CAS.

Note. PC-CAS = primary care competency assessment scale, interperefa = interpersonal relationship, integrefa = integrated healthcare service, profreefa = professional accountability, and caremefa care management

The 4-factor solutions of the PC-CAS based on the experts' opinions were developed. The intercorrelations among factors were identified in the model by the curve of two-headed arrows, and the numbers on each arrow represented the estimated correlation between factors. In this model, the factors loading of interpersonal relationship, integrated healthcare service, professional accountability and care management were r = 0.93, 0.91, 0.82 and 0.79 respectively. The congruency between the theory and the correlations estimated by the confirmed factor analysis provided evidence that 4-factor model was an appropriate fit into the data.

In order to test how the model fits into the data, Pedhauzer and Schemlkin (1991) suggested using multiple criteria of fit. Selected fit indices of the PC-CAS and its components are reported in Table 7. The chi-square, which is a measure of how well the model fits the data overall, was 4.69 with non significance. The Goodness of Fit Index (GFI), the overall amount of the covariation among the observed variables (items,

components, and domains) that can be accounted by the model (Table 7), was 0.99. The Adjusted Goodness of Fit Index (AGFI) was 0.97. Cole (1987) suggested that the value greater than 0.90 for GFI and 0.80 for AGFI usually indicate a good fit. Both the GFI and AGFI of this model indicated a good fit between the model and the data.

The Comparative Fit Index (CFI) is based upon the differences between the substantive and null model whose variables are completely independent. The CFI reported in Table 10was 1.00. CFI values close to 1.0 indicate a very good fit (Arbuckle, 1997; Bentler, 1988 cited in Swisher, Beckstead, & Bebeau, 2004).

The fit index reported in Table 9 is Root Mean Square of Approximation (RMSEA) with a 90% confidence interval. Browne and Cudeck (1993 cited in Stevens 2002) suggested that a RMSEA of 0.05 or smaller indicated a close fit. In the present study, the RMSEA of 0.50 and the 90% confidence interval upper limit of 0.50 indicated that the model fit the data well. In addition, Hu and Bentler (1999 cited in Swisher, Beckstead, & Bebeau, 2004) stated that the Standardized Root Mean Square Residual – RMR of 0.05 or smaller indicated a close fit. The last fit index stated in Table 7 is the chi-square, which is the ratio of chi-square divided by its degree of freedom (χ^2 / df), is also used to evaluate if the model is a true representative of the observed data. An ideal fit has χ^2 / df ratio of 1.00. The values of 2.00 to 3.00 are good and values greater than 5.0 are unacceptable (Hair et al., 1998). In the present study, the χ^2 / df was 2.38, thus the result indicated that the model was fit and was truly representative of the observed data.

After the CFA testing was conducted the PC-CAS consisted of four domains, within 23 components, and 55 items. The interpersonal relationship domain consists of 6-component and 14 items. The integrated healthcare service consists of 5-component

and 14 items. The professional accountability composes of 6-component and 17 items. The care management consists of 6-components and 10 items. The model of the domains, the components, and the items of PC-CAS fit the data (N = 407). Ten items (CP9, CP10, CP11, CP14, CP27, CP38, CP49, CP51, CP54, and CP59) were dropped indicating they were fit data of the model but they did not estimate or predict the latent variables very well.

The internal structure of the PC-CAS (version 65 items) consisted of four domains and 23 components. The CFA was used to test its internal structure as presented by 5 figures (Figure 5-9). Each figure showed the number of factor loading and t values of the intercorrelation among items and components that represented the estimate or prediction. The pair with pale and no arrow indicated non-significant correlation ($t < |2|$); this item could not estimate or predict its component and should be dropped. In addition, the arrow represented the estimated factor loading (regression weight) of the item and its component, the factor loading more than 0.30 was reconsidered. Those figures would make it easily understandable and present clearly each model (domain). The items were dropped because they included the criteria of rejection indicating. Even though they were fit data for each model they could not estimate or predict the latent variables (its component) very well. Each item might be unpractical from the PC providers' views but it was significant in the PC-CAS' s structure which was developed by the experts. According to the PC providers' roles in daily work, they collaborated in their work although not so well. In Some PCUs, the PC providers' roles were clearly set and had assigned responsibilities under their job-descriptions. In other PCUs that were not the case because all PC providers would do all types of work together. In addition, the PC providers in this study were

professional nurses who came from hospitals (77.50%). Thus most of their views were not expressed on community settings (CP9, CP10, CP11, CP14, CP27 and CP54), including on real situations in which the PCUs lacked of resources enabling them to carry out their duties to be efficient (CP38, CP49 and CP51). Furthermore, in the internal structure of the PC-CAS (version 55 items) should be tested to confirm that the structure is fit.

Hypothesis testing

Two hypotheses based on Benner's model were tested to confirm the construct validity of the PC-CAS. They evaluated the ability of instruments to confirm Benner's model that hypothesized "the duration of primary care experience, duration of the PCU employment, and educational level are correlated with PC providers' competency." In the present study, two hypotheses were tested.

Hypothesis # 1 *"the mean score of the PC-CAS of full-time PC providers was higher than the mean score of the PC-CAS of part-time PC providers."*

The PC-CAS's mean scores of 360 full-time PC providers and 59 part-time PC providers were compared by t-test. The comparison results of mean differences between the two groups are presented in Table 8.

Table 8

Comparison of Mean Differences between PC-CAS Scores of Full-time and Part-time PC Providers.

	Full-time (n = 360)		Part-time (n = 59)		t-value	p
	Mean	SD	Mean	SD		
Interpersonal relationship	69.82	8.56	67.40	10.16	1.94	0.05
Integrate Health care	55.03	7.04	53.58	9.29	1.38	0.16
Profession accountability	75.53	8.44	76.86	9.72	-1.09	0.27
Care Management	47.70	7.21	42.40	10.85	4.82	0.01
Total	247.94	28.42	240.86	35.00	1.69	0.09

The full-time PC providers reported the PC-CAS mean score of 247.94 (SD = 28.42) whereas part-time PC providers' mean score was 240.86 (SD = 35.00). The mean difference of the total score was not statistically significant ($t = 1.69$, $p \geq .05$) but the score of care management was a statistically significant difference ($t = 4.82$, $p < .05$) with the full-time PC providers having a higher score than that of the part-time group.

The finding indicated that the part-time PC providers involved with care management of the PCUs, i.e., resource management, service system management, information management, environmental health management, and quality management competencies' score less than that of the full-time group. According to the criteria of part-time PC providers work at the PCU, i.e., schedule and occasion

(Table 5), it supported that the part-time PC providers only performed to provide healthcare service at the PCUs. Their roles under job-descriptions of both groups should be different because the job-descriptions guide them to perform their roles within scope of practice reflecting their competency (ANCC, 1997 cited in Waddell, 2001). Based on the adult learning theory (Lieb, 1991), activities and experiences that occur repeatedly and in repeated situations would result in the learner developing greater competency in those situations. It indicated that if full-time PC providers had more activities and experiences in care management than the part-time group their competency would be greater. As a result, the different mean score of care management between full-time PC providers and part-time group was significant with the full-time group's score higher than the part-time one.

Furthermore, almost all of the mean scores of the full-time PC providers were higher than the part-time ones except the mean score of professional accountability. Hence, the part-time PC providers who have worked at the hospital are more concerned with moral sensitivity, patient rights, code of ethics, patient advocacy, self development, and professional development. While the full-time PC providers perform on many roles, e.g., provider, manager, counselor, facilitator, educator, leader and change agent, communicator, advocator, and researcher that were proposed by Boontong (2000), Hattakit et al. (2001), Konggumnerd (2003), Nuntaboot et al. (2001), Bureau of Nursing (2000), Phongpipattanapan (2002), and Wongprayoon and Authid (2004). However, the total of the mean score of PC-CAS between the full-time PC providers and the part-time group was not significant. The PCU needed both full-time PC providers and part-time group to have high primary care competency. While, almost of all mean score of the PC-CAS between the full-time PC providers and the

part-time group, the finding showed that the mean score of the full-time PC providers were more than that of the part-time group.

Therefore, the finding showed that only the mean difference of care management between the full-time PC providers and the part time group was statistically significant. ($t = 4.82$, $p < .05$. The result indicated that the full-time PC providers had higher care management competency scores than that of the part-time group. The result supported Benner's hypothesis and adult learning theory that the PC providers who have more experience, more time of working have higher competency than other (Benner, 1984). In addition, it also supported role theory (Park & Linton, 1936 cited in Biddle & Thomas, 1966) that full-time PC providers have worked and trained in care management of the PCUs under their job-descriptions (roles of particular status) that guided them to perform their roles within scope of practice reflecting their competency. The evidence claimed that the full-time PC providers have more care management competency than the part-time group.

Hypothesis # 2 *"The duration of experience/time/education would be positively correlated with the competency level."*

The correlation of PC - CAS scores and duration of primary care experience, duration of the PCU employment, and educational level of 419 PC providers were tested by using Pearson's product moment correlation coefficients. The results show positive significant relationship between the duration of primary care experiences, duration of the PCU employment, and educational level and the PC-CAS scores are presented in Table 9.

Table 9

Correlations among the PC Providers' Competency and Duration of Primary Care Experiences, Duration of the PCU Employment and Educational Level (N = 419).

	Duration of primary care experiences	Duration of the PCU employment	Educational level
Primary care competency	0.11*	0.17**	0.12*

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

The significant correlations between the PC providers' competency and the duration of primary care experiences, duration of the PCU employment, and educational level were found ($r = 0.11 - 0.17$, $p < .05$) but the relationships were very small. The finding indicated that the PC-CAS scores of the PC providers were changed when their primary care experiences, duration of the PCU employment, and education level increased. Hence the approach was supportive evidence in the theoretical foundation of the competency concept based on Benner's model and adult learning theory. The theory mentioned that the activities and experiences which occur repeatedly and in repeated situations would result in the learner developing greater competency in those situations. According to the role theory by Park and Linton (1936 cited in Biddle & Thomas, 1966), PC providers' roles were expected behaviors of one who held particular status which established job-descriptions. Their job-descriptions guide them to perform their roles within scope of practice reflecting their competency (ANCC, 1997 cited in Waddell, 2001). Thus, if the primary care

experiences, duration of the PCU employment, and education of the PC providers increased their competency would also increase. The PC providers' competency could change with primary care experiences, duration of the PCU employment, and educational level. In addition, the relationships were very small indicating other factors would influence them. This may be caused by the large sample size or the extraneous variables.

Therefore, the hypotheses testing indicated that the PC-CAS is based on the theoretical foundation concept. The evidence supports Benner's model including adult learning theory and indicates that the PC-CAS are varied by the duration of primary care experiences, duration of the PCU employment, and the educational level of the PC providers.

Reliability

A pre-test for tryout PC-CAS (65 items) was conducted with 14 PC providers. All were females with average age of 38.50 years (SD = 6.29). They were Buddhist, 78.60 % (n = 11) were married and had bachelor degree. PCU experiences were 5.20 years (SD = 5.44), 85.70 % (n = 12) had been NP training course and within 50 % (n = 7) were four-month training. In addition, 57.10 % (n = 8) PC providers had been working at community hospitals, whereas 14.30 % (n = 2) had never worked anywhere else. Cronbach's Alpha coefficient was used to test the internal consistency by the total and four domains. The test-retest which tested the stability was presented by percentage of agreements. The results of the PC-CAS version, 65-item reliability (Table 10), were described below.

Table 10

Cronbach' s Alpha Coefficient and Percentage of Agreement Reliability of the Final Draft of the PC-CAS - 65 Items (n = 14).

Dimensions	Items	Cronbach' s Alpha		Percentage of agreement
		1st	2nd	
Interpersonal relationship	18	0.90	0.84	81.75
Integrated healthcare service	15	0.87	0.76	79.52
Professional accountability	19	0.89	0.87	78.65
Care management	13	0.79	0.83	82.41
Total	65	0.96	0.94	80.58

The internal consistency of PC-CAS scales was reasonably good. The Cronbach's alphas of the domains were ranged from 0.79 to 0.90 and total of 0.96 on the first time and were ranged from 0.76 to 0.87 with the total of 0.84 on the second time. Based on Pedhazur and Schmelkin (1991), the results indicated that the items of the PC-CAS were homogeneous because the high range of subscales' alpha might come from the process of 65 items development where qualitative data enriched and extended what was known about the sub-scales of the primary care competency concept. Also Burns and Grove (2001) and Polit and Hungler (1995) stated that reliability value of newly scale above 0.70 was considered satisfactory. These high scores indicated good internal consistency among PC-CAS items.

As for the percentage of agreement, the total was 80.58 which is a reasonable acceptability. The acceptable values might be 75.00 or greater of twice time or twice occasions within the same participants (Burns & Grove, 2001; Waltz, Strickland, &

Lenz, 1991). The finding indicates that the PC-CAS version 65-item has the stability which supports that the competency is a state measure and stable for some degree. Therefore, stability reliability and the internal reliability of the PC-CAS were acceptable values.

In addition, the PC-CAS version 55-item was conducted to test reliability for confirming with 23 others PC providers. All were females with average age of 34.70 years (SD = 6.32). They were Buddhist, 91.30 % (n = 21) were married (56.50% (n = 13) and had bachelor degree, 95.70% (n = 21) and master degree (n = 2). PCU experiences were 3.30 years (SD = 5.04), had been working at community hospitals, 82.60 % (n = 19). Cronbach's Alpha coefficient was used to test the internal consistency by the total and four domains. The test-retest which tested the stability was presented by percentage of agreements. The results of the PC-CAS (the final version, 55-item) reliability are presented in Table 11.

Table 11

Cronbach' s Alpha Coefficient and Percentage of Agreement Reliability of the Final Version of the PC-CAS - 55 Items (n = 23).

Dimensions	Items	Cronbach' s Alpha		Percentage of agreement
		1st	2nd	
Interpersonal relationship	14	0.87	0.94	87.88
Integrated healthcare service	14	0.91	0.87	70.00
Professional accountability	17	0.84	0.76	68.65
Care management	10	0.72	0.70	78.26
Total	55	0.96	0.95	78.19

The internal consistency of PC-CAS (55 items) was reasonably good. The Cronbach's alphas of the domains were ranged from 0.72 to 0.91 and total of 0.96 on the first time and were ranged from 0.76 to 0.94 with the total of 0.95 on the second time. As for The percentage of agreement, the total was 78.19, the domains was ranged from 68.65 – 87.88. The acceptable values might be 75.00 or greater of twice times or twice occasions within the same participants (Burns & Grove, 2001; Waltz, Strickland, & Lenz, 1991). The finding indicates that the PC-CAS version 55-item has the stability which supports that the competency is a state measure and stable for some degree, although two domains (integrated healthcare service and professional accountability) were unacceptable values (68.65% and 70.00%). Therefore, stability

reliability and the internal reliability of the final version of PC-CAS (55 items) were acceptable values.

The results of reliability both in internal consistency and stability were acceptable. The internal reliabilities' result indicated that the relevancy between item and item including item and component were (high) moderate to a high correlation. The items of the PC-CAS scale expressed homogeneity and addressed the extent to which all its items measure the primary care competency (same variables). A homogenous PC-CAS 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 because all of the PC-CAS' s items consistently measure primary care competency.

The stabilities' result referred to consistent results being obtained on repeated administrations of the measurement with the same PC providers. It indicated that the PC-CAS was consistent on stability although the competency of the PC providers might have low temporal stability because it was a state measure. The primary care competency can change if the PC providers acquire experience, training, and learning during that time. However the PC-CAS would be stable on a period of time. Based on Nunnally and Bernstein (1994), two weeks interval was a good time to test the primary care competency of the PC providers by using the PC-CAS. The percentage of agreement of the PC providers' scores between time # 1 and time # 2 was highly indicating the PC-CAS to be stable during that time.

Social desirability test

This study was tested to confirm social desirability that is a potential concern with interpreting responses to social-related measures, especially the self-report measure. The results are presented in Table 12 & 13.

Table 12

Social Desirability Testing (N = 419).

	PC-CAS (65 items)	Interpersonal relationship	Integrated healthcare service	Professional accountability	Care management
Social desirability	- 0.23*	- 0.26*	- 0.22*	-0.19	-0.14

* Correlation is significant at the 0.05 level (2-tailed)

The results (Table 12) showed that the final draft of the PC-CAS (65 items) score and two domains; interpersonal relationship and integrated healthcare service have reverse correlation with the social desirability score at 0.50 level (r = -0.23, -0.26, -0.22, p< .05). On the other hand, professional accountability and care management score are a not significant correlation. The finding indicated that the PC providers who responded to the PC-CAS questionnaires might feel free to answer and so their answers were not based on social desirability.

In addition, the social desirability test of the final version of the PC-CAS (55 items in Table 13) was confirmed. The result showed that almost all scores do not show a significant correlation. Only interpersonal relationship has a reverse significant correlation with the social desirability score (r = -0.24 p < .05). The

finding indicated that the PC providers who responded to the final version of the PC-CAS questionnaires (55-item) were not based on social desirability- they felt free to answer.

Table 13

Social Desirability Testing (N = 69).

	PC-CAS (55 items)	Interpersonal relationship	Integrated healthcare service	Professional accountability	Care management
Social desirability	- 0.21	- 0.24*	- 0.18	-0.14	-0.14

* Correlation is significant at the 0.05 level (2-tailed)

Summary

The study aimed to develop primary care competency assessment scale (PC-CAS) for PC providers in Thailand. The PC-CAS development consisted of items generation and its psychometric properties evaluation (Figure 10). At the beginning of the study, the conceptual structures of primary care competency for the Thai PC providers were conducted by using the reviewed literature and expert opinions through interview method. Twenty three components under four domains (interpersonal relationship, integrated healthcare service, care management, and professional accountability) were developed. The items generation and validation were conducted by using three rounds of the Delphi technique. Eighty one items were finally developed into the PC-CAS's items generation. After that, the content validity was examined by four experts, the CVI value was good. The 65 items were retained to be the final draft of the PC-CAS whereas; other 16 items were

dropped because they did not meet its content validity criteria. The internal consistency and stability reliability were of acceptable values. The construct validity, especially hypotheses testing, supported the Benner theory, adult learning theory, role theory, and competency concept. At the final stage of the study, the confirmatory factor analysis (CFA) was used to test the construct validity of the PC-CAS. Finally, the PC-CAS consisted of 55 items under 23 components and four domains. The interpersonal relationship is composed of 14 items, integrated healthcare service includes 14 items, care management consists of 10 items, and professional accountability includes 17 items. The fit indices of all models fit into the data thus the results indicate that the indicated items, components, and domains belong to their own components and domains of the PC-CAS. Almost all sound psychometric properties of the PC-CAS were found to imply non-social desirability in the answers. Therefore, the PC-CAS would be used to measure the primary care competency for the Thai PC providers.

Table 7

Fit Indices of CFA models (N = 407).

Fit Index	Acceptable Values	Integrated health care service	Care management	Interpersonal relationship	Professional accountability	PC-CAS
Chi-square	At least Non Sig.	147.77 p = 0.000*	70.40 p = 0.003*	320.98 p = 0.000*	313.81 p = 0.000*	4.76 p = 0.09
Degree of freedom (df)	-	71.00	42.00	98.00	114.00	2.00
χ^2 / df	< 3.00	2.46	1.67	3.27	2.75	2.38
Goodness of Fit Index - GFI	> 0.90	0.95	0.97	1.00	0.92	0.99
Adjusted Goodness of Fit Index - AGFI	> 0.80	0.91	0.94	0.99	0.87	0.97
Comparative Fit Index - CFI	> 0.90	0.99	1.00	1.00	0.99	1.00
Root Mean Square Error of Approximation - RMSEA	< 0.08	0.06	0.04	0.07	0.06	0.05
Standardized root Mean Square Residual (RMR)	< 0.05	0.03	0.02	0.03	0.04	0.01

* Significance