APPENDICES

Appendix A

Demographic Data Form

Patient code.................................... Hospital number..

Instruction: Identify the demographic data by placing a √ in the box or filling in the blank

1. Patient age ....year

2. Sex ☐ Male ☐ Female

3. Final diagnosis of the patient categorized by ICD 10

   ☐ Diseases of the respiratory system

   ☐ Diseases of the digestive system

   ☐ Renal failure

   ☐ Diseases of the circulatory system

   ☐ Diseases of the nervous system

   ☐ Infectious and parasite diseases

   ☐ Injury

   ☐ Other diseases (identify)............................

4. Name of ICU Admission......................................

5. Location prior to ICU Admission

   ☐ Emergency room in this hospital

   ☐ General units in this hospital (identify)....................................

   ☐ Other ICU in this hospital (identify).......................

   ☐ Sub ICU in this hospital (identify)..................................

   ☐ Transfer from other hospital

6. Day of admission Date/month/year ..../........./.................

   Time of admission................................

7. Nutrition indicators

     7.1 Serum albumin level .... g/L

     7.2 Lymphocyte count.. (10^3/cub mm)

8. Duration of mechanical ventilation.................... days..............hours.

9. Length of ICU stay.......................days

10. Day of discharge   Date/month/year ..../........../..............

                                  Time of discharge...............................

11. Discharge status   ☐ Death

                    ☐ Transfer to a general unit (identify name of referral unit).............................

                    ☐ Transfer to other hospital

                    ☐ Patient need to go home (identify a reason why patient need to back home).........

                    ☐ Discharge to home

Appendix B

Simplified Acute Physiology Score II

Patient code............. Hospital number……………......Day/Month/Year……/……/…..

Variables Points	26	13	12	11	9	7	6	5	4	3	2	0	1
Age (Year)												<40	
Heart rate, beats/min			<40								40-69	70-119	
Systolic BP, mmHg		<70						70-99				100-199	
Body temperature, °C (°F)												<39°(<102.2°)	
Only if ventilated or continuous pulmonary artery pressure													
• PaO₂ mmHg/FIO₂				<100	100-199		≥200						
• PaO₂ KPa/FIO₂				<13.3	13.3-26.5		≥26.6						
Urinary output, L/d			•	<0.500					0.5-0.999			≥1.0	
Serum urea level, mmol/L (g/L) or												<10.0 (<0.6)	
Serum urea nitrogen level, mg/dL												<28	
WBC count (10³/cu mm)			<1.0							<3.0		1.0-19.9	
Serum potassium, mmol/l												3.0-4.9	
Serum sodium level, mmol/l								<125				125-144	≥145
Serum bicarbonate level, mEq/L							<15			15-19		≥20	
Bilirubin level, mg/dL												<68.4 (<4.0)	
Glasgow Coma Score	<6	6-8					9-10	11-13				14-15	
Chronic diseases													
Type of admission												Scheduled surgical	

Variables Points	2	3	4	6	7	8	9	10	12	15	16	17	18
Age (Year)					40-59				60-69	70-74	75-79		≥80
Heart rate, beats/min			120-159		≥160								
Systolic BP, mmHg	≥200												
Body temperature, °C (°F)		≥39°(≥102.2°)											
Only if ventilated or continuous pulmonary artery pressure													
• PaO₂ mmHg/FIO₂													
• PaO₂ KPa/FIO₂													
Urinary output, L/d													
Serum urea level, mmol/L (g/L) or													
Serum urea nitrogen level, mg/dL					100-299 (0.6-1.79)			≥20 (≥1.8)					
WBC count (10³/cu mm)					20-39.9			≥40					
Serum potassium, mmol/l		≥200											
Serum sodium level, mmol/l		≥50											
Serum bicarbonate level, mEq/L													
Bilirubin level, mg/dL													
Glasgow Coma Score			68.4-102.5 (4.0-5.9)				≥102.6 (≥6.0)						
Chronic diseases							Metastatic cancer	Hematologic malignancy					AIDs
Type of admission				Medical	Unscheduled surgical								

Appendix C

Nurse Staffing Data Form

ICU name..............................

Instruction: Identify nurse staffing data by filling the number of nursing staff and patients in the blank.

Day/Month/ Year	Nursing shift	The number of personnel categorized by type of nursing staff (unit: in person)			The number of patients (unit: in person)
		Registered nurses	Practical nurses	Helpers	
1/11/2005	D				
	E				
	N				
2/11/2005	D				
	E				
	N				
....	D				
	E				
	N				
30/7/2006	D				
	E				
	N				
31/7/2006	D				
	E				
	N				

Note: D= day shift (8.00-16.00), E= evening shift (16.00-24.00), N=night shift (24.00-8.00).

Appendix D

Health Personnel Cost Data Form

Section 1: ICU personnel's money allowance

Instruction: Filling the number of ICU personnel and hospital budget in FY 2005 in the blank.							
ICU personnel	The number of personnel (Unit: in person)	Total salaries by types of ICU personnel (Unit: in baht)	Total overtime costs by types of ICU personnel (Unit in baht)	Total professional fees by types of ICU personnel (Unit in baht)	Total medical care costs by types of ICU personnel (Unit in baht)	Total costs of evening and night shift duties by types of ICU personnel (Unit in baht)	Total consulting fees by types of ICU personnel (Unit in baht)
Intensivists							
Residents							
Registered nurse							
Practical nurses							
Helpers							

Section 2: Therapeutic intervention scoring system-28 (TISS-28)

Patient code...............................Hospital number...

Day/Month/Year........./.................../............. □ Day shift   □ Evening shift   □ Night shift

Instruction: Identify care activities provided to each patient by placing a √ in the blank
following these criteria: *Yes* (when the event occurs)
No (when the event does not occur)

Activity	Points	Evaluation	
		Yes	No
Basic activities			
1. Standard monitoring (Hourly vital signs, regular registration and calculation of fluid balance).	5		
....			
Cardiovascular support			
1. Single vasoactive medication (any vasoactive drug).	3		
....			
Ventilatory support			
1. Mechanical ventilation. Any form of mechanical or assisted ventilation with or without PEEP, muscle relaxation, spontaneous breathing with PEEP.	5		
....			
Renal support			
1. Hemofiltration technique. Dialytic technique.	3		
....			
Neurologic support			
1. Measurement of intracranial pressure			
....			
Metabolic support			
1. Treatment of complicated metabolic (acidosis or alkalosis).	4		
....			
Specific interventions			
1. Single specific interventions in the ICU. • Naso or orotracheal intubation • .... (Routine interventions without consequences to the clinical condition of the patient such as radiographs, echograhy, EKG, dressings or introduction of venous or arterial catheters are not included).	3		
....			
TISS-28 =			

Appendix E

Medical Care Cost Data Form

Section 1: Hospital operating costs.

Instruction: Filling the amount of hospital budget in FY 2005 (unit: in baht) in the blank.

Cost items	Oct, 2004	Nov, 2004	Dec, 2004	Jan, 2005	Feb, 2005	....	....	Sep, 2005	Total
Budget allowance for hospital personnel:									
• Salaries and wages of teaching physicians and other hospital personnel									
....									
Material costs									
• Costs of medical materials.									
....									
Utility costs									
• Costs of electricity									
....									
Rents for computers									
Rents for medical equipments									
Expenses for research									
Expenses for professional promotion.									
Others									

Section 2: Hospital revenues.

Instruction: Filling the amount of hospital revenues in FY 2005 (unit: in baht) in the blank.

Revenue items	Oct, 2004	Nov, 2004	Dec, 2004	Jan, 2005	Feb, 2005	....	....	Sep, 2005	Total
In-patient service revenue									
Out-patient service revenue									
Interest									
Income from land rent									
Income from waste incinerating fee									
Income from sale of medical care service for other health institutions									
Incomes from sale of laundry services									
Income from sale of food									

Section 3: Medical care of critically ill patients.

Patient code……………………… Hospital number…………………………..

Instruction: Filling unit price and the amount of services and products providing to each patient in the blank.

Services and products	Unit price	Admission date			Day 2nd			...			Discharge date		
		D	E	N	D	E	N	D	E	N	D	E	N
1. Radiology services													
1.1 Chest X-ray													
……….													
2. Laboratory services													
2.1 CBC													
……….													
3. Equipment usage													
3.1 Respirator volume													
……….													
4. Life supporting therapies													
4.1 CPR													
……….													
5. Drugs													
5.1 Dopamine													
……….													
6. Nutritional products													
6.1 BD													
……….													
7. Fluid infiltration													
7.1 5 % dextrose in NSS													
……….													
8. Disposable medical supplies													
8.1 Angiocath No…													
……….													
9. Blood products													
9.1 Whole blood													
……….													

Appendix F

Guideline for Completing Data Collection Forms

1. Admission data

Complete the following data in *demographic data form* when admitting a patient to the ICU:

Age: identify patient's age (in years) at last birthday.

Sex: mark √ as appropriate patient gender.

………………………………………..

2. Discharge data

Complete the following data at the time of discharge in *demographic data form.*

Duration of mechanical ventilation: identify duration (in days and hours) of undergoing

mechanical ventilation.

…………………………………………..

3. SAPS II scoring sheet

3.1 The SAPS II scoring sheet assesses the severity of illness of patients in the ICU. It is

made up of 12 physiological variables, a chronic health variable, type of admission and

age.

3.2 Assessment of severity of illness is performed during the first 24 hours after admission.

…………………………………………..

4. Nurse staffing data form

4.1 The nurse staffing data form is used to assess the number of registered nurses (RNs),

practical nurses (PNs) and helpers (HPs) in each nursing shift and each day from November 1,

2005 to May 31, 2006.

…………………………………………..

5. Health personnel cost data form

5.1 The form consists of two sections. Fist, it is a form used to assess the hospital budget allowance for ICU personnel for FY 2005 (including intensivists, residents, RNs, PNs, HPs). Second, it is a specific form to collect nursing care activities provided to a patient in an ICU.

………………………………………..

6. Medical care cost data form

6.1 The form consists of three sections. First, the form is used to assess hospital operating cost for FY 2005. Second, the form is used to obtain data about hospital revenue in FY 2005. Lastly, the form is used to assess medical care activities providing to each patient admitted to an ICU.

………………………………………..

Appendix G

Consent Form for the Participants

Part1: Instruction

My name is Petsunee Thungjaroenkul. I am studying in the doctoral degree at Faculty of Nursing, Chiang Mai University. I am conducting my research on the title "Factors Influencing Patient Cost and Length of Stay in Adult Intensive Care Units (ICUs)". The Objectives of the study is to assess patient cost and length of stay in intensive care units and to explore the factors affecting patient cost and length of ICU stay.

I ask for permission to collect patient charts and documents regarding medical care activities providing to each critically ill patient, length of stay and patient characteristics. This research will be valuable for nursing practice and nursing administration. It will serve as basic data to develop interventions and management for patients in adult ICUs. Your information will be kept confidential. No identity would be revealed in research reports or publications. Only group data will be reported. I hope to get your permission and thank you very much for your consideration and collaboration.

Part 2: For participant

I was informed the information of the study mentioned above. I understand and willing to participate in the study.

Signature......................(Participant)

Signature......................(Witness)

Date.........Month..........Year..............

เอกสารแสดงการยินยอมเข้าร่วมวิจัย

ส่วนที่ 1 คำชี้แจง

ดิฉัน เพชรสุนีย์ ทั้งเจริญกุล ขณะนี้กำลังศึกษาอยู่ในระดับปริญญาเอก ที่คณะพยาบาล
ศาสตร์ มหาวิทยาลัยเชียงใหม่ และกำลังทำวิจัยเรื่อง ปัจจัยที่มีผลต่อต้นทุนของผู้ป่วยและระยะเวลา
การนอนรักษาในหอผู้ป่วยวิกฤติผู้ใหญ่ โดยมีวัตถุประสงค์เพื่อศึกษาต้นทุนของผู้ป่วยและระยะเวลา
การอยู่ในหอผู้ป่วยวิกฤติผู้ใหญ่และค้นหาปัจจัยที่มีผลต่อต้นทุนของผู้ป่วยและระยะเวลาการอยู่ใน
หอผู้ป่วยวิกฤติ

ดิฉันขออนุญาตจากท่านให้ดิฉันและผู้ช่วยวิจัยดำเนินการเก็บรวบรวมข้อมูลในรายงานการ
รักษาและบันทึกทางการพยาบาลของผู้ป่วยในหอผู้ป่วยวิกฤตินี้ ประกอบด้วย ข้อมูลเกี่ยวกับปริมาณ
และมูลค่าของทรัพยากรที่ใช้ในการรักษาพยาบาลผู้ป่วยวิกฤติ ระยะเวลาการรักษาพยาบาลและ
คุณลักษณะของผู้ป่วย โดยข้อมูลที่ได้จากการวิจัยครั้งนี้จะเป็นประโยชน์อย่างยิ่งในการพัฒนาด้าน
การบริหารและการบริการผู้ป่วยในหอผู้ป่วยวิกฤติต่อไป ข้อมูลที่เก็บรวบรวมครั้งนี้จะถูกเก็บเป็น
ความลับ จะไม่มีชื่อของผู้ป่วยหรือบุคลากรในโรงพยาบาลของท่านปรากฏอยู่ในรายงานการ
เผยแพร่ใดๆและการเสนอข้อมูลจะเสนอโดยภาพรวมเพื่อประโยชน์ในเชิงวิชาการเท่านั้น ดิฉันหวัง
เป็นอย่างยิ่งว่าจะได้รับความอนุเคราะห์จากท่านและขอขอบพระคุณอย่างสูงมา ณ โอกาสนี้

ส่วนที่ 2 สำหรับผู้เข้าร่วมวิจัย

ข้าพเจ้าได้รับคำชี้แจงเกี่ยวกับการวิจัยดังที่ได้กล่าวข้างต้น มีความเข้าใจ และยินดีที่จะเข้า
ร่วมการวิจัยด้วยความสมัครใจ

ลงชื่อ.................................(ผู้เข้าร่วมวิจัย)

ลงชื่อ.................................(พยาน)

วันที่........... เดือน.........................พ.ศ.........................

Appendix H

Approval Letters

1. REC approval

136/2005

CERTIFICATE OF ETHICAL CLEARANCE
Research Ethics Review Committee
Faculty of Nursing, Chiang Mai University

The Research Ethics Review Committee of the Faculty of Nursing, Chiang Mai University declares approval of

Research Project Title : Factors Influencing Patient Cost and Length of Stay in Adult Intensive Care Units

Principal Investigator : Miss Petsunee Thungjaroenkul

Participating Institution : Doctoral Student , Faculty of Nursing Chiang Mai University

The above research project does not violate rights, well being, and/or endanger human subjects and is justified to conduct the research procedures as proposed.

This clearance is valid from the date of approval to January 31, 2007

Date of approval October 13, 2005

(Professor Dr.Wichit Srisuphan)
Chair, Research Ethics Review Committee
Faculty of Nursing, Chiang Mai University

(Associate Professor Dr. Wipada Kunaviktikul)
Dean of Faculty of Nursing, Chiang Mai University

2. An approval letter to collecting data in the research setting

บันทึกข้อความ

ส่วนราชการ คณะแพทยศาสตร์ (โทร.๕๑๓๙, ๕๒๒๔)

ที่ ศธ ๐๕๑๕(๐๕)/ 18911   วันที่ ๑๑ พฤศจิกายน ๒๕๔๘

เรื่อง อนุญาตให้นักศึกษาพยาบาลระดับปริญญาเอกเข้าเก็บข้อมูลประกอบการทำวิจัยเพื่อวิทยานิพนธ์

เรียน คณบดีคณะพยาบาลศาสตร์

ตามบันทึก ที่ ศธ ๐๕๑๕(๐๕.๑.๒)/๖๑๑๑ ลงวันที่ ๓๑ ตุลาคม ๒๕๔๘ คณะพยาบาลศาสตร์ ขออนุญาตให้ นางสาวเพชรสุนีย์ ทั้งเจริญกุล นักศึกษาปริญญาเอก หลักสูตรพยาบาลศาสตรดุษฎีบัณฑิต สาขาวิชาพยาบาล ศาสตร์ เข้าเก็บข้อมูลจากรายงานการรักษาและบันทึกทางการพยาบาลใน หอผู้ป่วยวิกฤติศัลยศาสตร์ หอผู้ป่วยวิกฤติอายุรกรรม ๑, ๒ และ ๓ รวมทั้งสถิติการให้บริการและ รายงานค่าใช้จ่ายในการดำเนินงานของหน่วยงานในสังกัดโรงพยาบาลมหาราชนครเชียงใหม่ทั้งหมด จำนวน ๑๑ หน่วยงาน และหน่วยงานในสังกัดสำนักงานเลขานุการทั้งหมด จำนวน ๑๒ หน่วยงาน ใน ระหว่างเดือนพฤศจิกายน ๒๕๔๘ ถึงเดือนเมษายน ๒๕๔๙ เพื่อนำข้อมูลที่ได้ไปประกอบการทำวิจัยเพื่อ วิทยานิพนธ์เรื่อง "ปัจจัยที่มีผลต่อต้นทุนของผู้ป่วยและระยะเวลาการอยู่ในหอผู้ป่วยวิกฤติผู้ใหญ่" ความ ละเอียดแจ้งแล้ว นั้น

คณะแพทยศาสตร์พิจารณาแล้วไม่ขัดข้องประการใด อนุญาตให้ นางสาวเพชรสุนีย์ ทั้งเจริญกุล เข้าเก็บข้อมูลตามกำหนดวันที่ขอไปได้

จึงเรียนมาเพื่อทราบ.

(รองศาสตราจารย์ ดร.ปราโมทย์ วณิลย์ธนาคม)
รองคณบดี ปฏิบัติราชการแทน
คณบดีคณะแพทยศาสตร์

เรียน ประธานหลักสูตร พย.ด.
จึงเรียนมาเพื่อ
○ โปรดพิจารณาลงนาม
○ โปรดพิจารณา/สั่งการ
○ โปรดทราบ

183
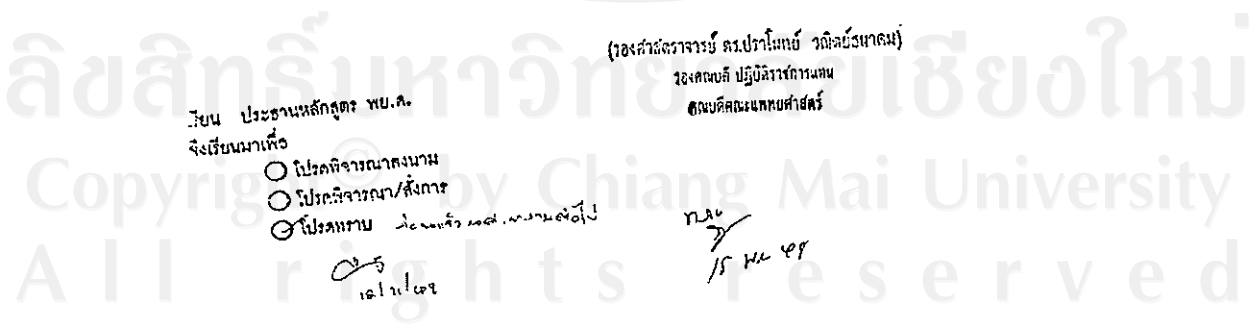
Appendix I

The Analysis of Depreciation Costs of Buildings and Equipments in the Study

Description	Amount of included equipment and buildings (unit: in items)	The expected working life (unit: in year)	Aggregated purchasing costs (unit: in baht)	Average depreciation costs per year (unit: in baht)*
Medical equipment	969	8	239,550,036.0	29,943,754.5
Non-medical equipment	1,405	10	297,984,948.0	29,798,494.8
Automobile	15	8	158,416,336.0	19,802,042.1
Computers	185	5	49,686,586.0	9,937,317.2
Buildings	2	25	502,380,400.0	20,095,216.0

Average depreciation costs of building and equipment = The sum of average depreciation costs of medical equipment, non medical equipment, automobile, computers and buildings
= 109,576,824.6 baht

Note:

* Average depreciation cost per year was calculated by dividing total purchasing costs (column 3) with the expected working life (column 2).

Appendix J

A Summary Statement of ICU Personnel Money's Allowance for FY 2005

ICU personnel	Actual number of personnel (in person)	Annual budget's allowance (in baht)	Average annual budget allowance for one person (in baht)*	Average hourly budget allowance for one person (in baht)**
Intensivists	85	44,690,811.0	525,774.3	180.1
Residents	85	12,806,470.0	150,664.4	51.6
Registered nurses	60	14,472,336.0	241,205.6	82.6
Practical nurses	19	3,624,364.0	190,756.0	65.3
Helpers	14	1,496,080.0	106,862.9	36.6

Note:

* Average annual budget allowance for one person was calculated by dividing annual budget allowance (column 3) with the number of personnel (column 2).

** Average hourly budget allowance for one person was calculated by dividing average monthly budget allowance for one person (column 4) with 2,920 hours (365 day X 8 hours).

Appendix K

A Summary Statement of Hospital Operating Costs and Revenues for FY 2005

Description	Amount (in baht)	Total (in baht)
Hospital operating costs		
a) Teaching physician's budget allowance.	54,832,033.6	
b) Hospital personnel's budget allowance.	717,327,880.8	
c) Material cost-medical and non medical supplies.	1,098,975,240.9	
d) Utility cost	35,498,928.6	
e) Depreciation costs of buildings and equipment	109,576,824.6	
f) Others	148,069,642.7	
The sum of hospital operating costs		2,164,280,551.2
Hospital revenues		
a) In-patient revenue	636,923,924.7	
b) Out-patient revenue	1,247,792,803.0	
c) Non-patient revenues (i.e. interest, rent fee, waste incinerating fee, and revenue from the sales of medical services, food, and laundry services)	124,242,317.2	
The sum of hospital revenues		2,008,959,044.8

$$\text{Cost to Charge ratio} = \frac{\text{The sum of hospital operating costs for FY 2005}}{\text{The sum of hospital revenues for FY 2005}}$$

$$= \frac{2,164,280,551.2}{2,008,959,044.8}$$

$$= 1.077$$

Appendix L

Bivariate Correlations

1. Bivariate correlations among age, ICU types, day of patient admission, time of patient admission, severity of illness, nutrition status, nurse staffing and length of ICU stay.

Correlations

		AGE	ICU types	Date of admission	Time of admission	Severity score at admission	ratio of RN to other staff	ratio of RN to Pt	nutrition group by albumin	nutrition group by lymphocyte	Ln(LOS)
AGE	Pearson Correl	1	.149*	.057	.138*	.259*	.092	.004	-.050	-.106	.131*
	Sig. (2-tailed)	.	.021	.380	.032	.000	.154	.945	.468	.099	.042
	N	242	242	242	242	242	242	242	217	242	242
ICU types	Pearson Correl	.149*	1	-.002	.093	.500*	.141*	.367*	-.050	-.015	.378*
	Sig. (2-tailed)	.021	.	.972	.150	.000	.028	.000	.465	.815	.000
	N	242	242	242	242	242	242	242	217	242	242
Date of admission	Pearson Correl	.057	-.002	1	.011	.028	-.104	-.031	.203*	-.027	-.088
	Sig. (2-tailed)	.380	.972	.	.867	.660	.107	.632	.003	.671	.172
	N	242	242	242	242	242	242	242	217	242	242
Time of admission	Pearson Correl	.138*	.093	.011	1	.034	-.144*	-.049	-.061	.106	-.069
	Sig. (2-tailed)	.032	.150	.867	.	.597	.025	.444	.374	.102	.285
	N	242	242	242	242	242	242	242	217	242	242
Severity score at admission	Pearson Correl	.259*	.500*	.028	.034	1	.256*	.277*	-.181*	.003	.002
	Sig. (2-tailed)	.000	.000	.660	.597	.	.000	.000	.008	.960	.978
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to other	Pearson Correl	.092	.141*	-.104	-.144*	.256*	1	.453*	-.067	-.050	-.095
	Sig. (2-tailed)	.154	.028	.107	.025	.000	.	.000	.328	.438	.141
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to Pt	Pearson Correl	.004	.367*	-.031	-.049	.277*	.453*	1	-.208*	-.062	-.046
	Sig. (2-tailed)	.945	.000	.632	.444	.000	.000	.	.002	.336	.477
	N	242	242	242	242	242	242	242	217	242	242
nutrition group by albumin	Pearson Correl	-.050	-.050	.203*	-.061	-.181*	-.067	-.208*	1	-.034	-.093
	Sig. (2-tailed)	.468	.465	.003	.374	.008	.328	.002	.	.620	.174
	N	217	217	217	217	217	217	217	217	217	217
nutrition group by lymphocyte	Pearson Correl	-.106	-.015	-.027	.106	.003	-.050	-.062	-.034	1	-.133*
	Sig. (2-tailed)	.099	.815	.671	.102	.960	.438	.336	.620	.	.038
	N	242	242	242	242	242	242	242	217	242	242
Ln(LOS)	Pearson Correl	.131*	.378*	-.088	-.069	.002	-.095	-.046	-.093	-.133*	1
	Sig. (2-tailed)	.042	.000	.172	.285	.978	.141	.477	.174	.038	.
	N	242	242	242	242	242	242	242	217	242	242

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

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

2. Bivariate correlations among age, ICU types, day of patient admission, time of patient admission, severity of illness, nutrition status, nurse staffing and medical care cost per patient day.

Correlations

		AGE	ICU type	Date of admission	Time of admission	severity score at admission	ratio of RN to other staff	ratio of RN to Pt	nutrition group by albumin	nutrition group by lymphocyte	Ln(medical care cost per day)
AGE	Pearson Corr	1	.149*	.057	.138*	.259*	.092	.004	-.050	-.106	.146*
	Sig. (2-tailed)	.	.021	.380	.032	.000	.154	.945	.468	.099	.023
	N	242	242	242	242	242	242	242	217	242	242
ICU types	Pearson Corr	.149*	1	-.002	.093	.500*	.141*	.367*	-.050	-.015	.239*
	Sig. (2-tailed)	.021	.	.972	.150	.000	.028	.000	.465	.815	.000
	N	242	242	242	242	242	242	242	217	242	242
Date of admission	Pearson Corr	.057	-.002	1	.011	.028	-.104	-.031	.203*	-.027	.124
	Sig. (2-tailed)	.380	.972	.	.867	.660	.107	.632	.003	.671	.054
	N	242	242	242	242	242	242	242	217	242	242
Time of admission	Pearson Corr	.138*	.093	.011	1	.034	-.144*	-.049	-.061	.106	.073
	Sig. (2-tailed)	.032	.150	.867	.	.597	.025	.444	.374	.102	.259
	N	242	242	242	242	242	242	242	217	242	242
Severity score at admission	Pearson Corr	.259*	.500*	.028	.034	1	.256*	.277*	-.181*	.003	.489*
	Sig. (2-tailed)	.000	.000	.660	.597	.	.000	.000	.008	.960	.000
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to other staff	Pearson Corr	.092	.141*	-.104	-.144*	.256*	1	.453*	-.067	-.050	.071
	Sig. (2-tailed)	.154	.028	.107	.025	.000	.	.000	.328	.438	.273
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to Pt	Pearson Corr	.004	.367*	-.031	-.049	.277*	.453*	1	-.208*	-.062	.239*
	Sig. (2-tailed)	.945	.000	.632	.444	.000	.000	.	.002	.336	.000
	N	242	242	242	242	242	242	242	217	242	242
nutrition group by albumin	Pearson Corr	-.050	-.050	.203*	-.061	-.181*	-.067	-.208*	1	-.034	-.134*
	Sig. (2-tailed)	.468	.465	.003	.374	.008	.328	.002	.	.620	.049
	N	217	217	217	217	217	217	217	217	217	217
nutrition group by lymphocyte	Pearson Corr	-.106	-.015	-.027	.106	.003	-.050	-.062	-.034	1	-.223*
	Sig. (2-tailed)	.099	.815	.671	.102	.960	.438	.336	.620	.	.000
	N	242	242	242	242	242	242	242	217	242	242
Ln(medical care day)	Pearson Corr	.146*	.239*	.124	.073	.489*	.071	.239*	-.134*	-.223*	1
	Sig. (2-tailed)	.023	.000	.054	.259	.000	.273	.000	.049	.000	.
	N	242	242	242	242	242	242	242	217	242	242

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

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

3. Bivariate correlations among age, ICU types, day of patient admission, time of patient admission, severity of illness, nutrition status, nurse staffing and nursing personnel cost per patient day.

Correlations

		AGE	ICU types	Date of admission	Time of admission	Severity score at admission	ratio of RN to other staff	ratio of RN to Pt	nutrition group by albumin	nutrition group by lymphocyte	average nursing care cost per day (baht/day)
AGE	Pearson Correla	1	.149*	.057	.138*	.259*	.092	.004	-.050	-.106	-.024
	Sig. (2-tailed)		.021	.380	.032	.000	.154	.945	.468	.099	.715
	N	242	242	242	242	242	242	242	217	242	242
ICU types	Pearson Correla	.149*	1	-.002	.093	.500*	.141*	.367*	-.050	-.015	.302*
	Sig. (2-tailed)	.021		.972	.150	.000	.028	.000	.465	.815	.000
	N	242	242	242	242	242	242	242	217	242	242
Date of admission	Pearson Correla	.057	-.002	1	.011	.028	-.104	-.031	.203*	-.027	-.101
	Sig. (2-tailed)	.380	.972		.867	.660	.107	.632	.003	.671	.118
	N	242	242	242	242	242	242	242	217	242	242
Time of admission	Pearson Correla	.138*	.093	.011	1	.034	-.144*	-.049	-.061	.106	.111
	Sig. (2-tailed)	.032	.150	.867		.597	.025	.444	.374	.102	.084
	N	242	242	242	242	242	242	242	217	242	242
Severity score at admission	Pearson Correla	.259*	.500*	.028	.034	1	.256*	.277*	-.181*	.003	.131*
	Sig. (2-tailed)	.000	.000	.660	.597		.000	.000	.008	.960	.041
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to other	Pearson Correla	.092	.141*	-.104	-.144*	.256*	1	.453*	-.067	-.050	-.055
	Sig. (2-tailed)	.154	.028	.107	.025	.000		.000	.328	.438	.391
	N	242	242	242	242	242	242	242	217	242	242
ratio of RN to Pt	Pearson Correla	.004	.367*	-.031	-.049	.277*	.453*	1	-.208*	-.062	.404*
	Sig. (2-tailed)	.945	.000	.632	.444	.000	.000		.002	.336	.000
	N	242	242	242	242	242	242	242	217	242	242
nutrition group by albumin	Pearson Correla	-.050	-.050	.203*	-.061	-.181*	-.067	-.208*	1	-.034	-.175*
	Sig. (2-tailed)	.468	.465	.003	.374	.008	.328	.002		.620	.010
	N	217	217	217	217	217	217	217	217	217	217
nutrition group by lymphocyte	Pearson Correla	-.106	-.015	-.027	.106	.003	-.050	-.062	-.034	1	.024
	Sig. (2-tailed)	.099	.815	.671	.102	.960	.438	.336	.620		.713
	N	242	242	242	242	242	242	242	217	242	242
average nursing car cost per day (baht/	Pearson Correla	-.024	.302*	-.101	.111	.131*	-.055	.404*	-.175*	.024	1
	Sig. (2-tailed)	.715	.000	.118	.084	.041	.391	.000	.010	.713	
	N	242	242	242	242	242	242	242	217	242	242

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

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

Appendix M

The Distributions of Residuals

1. The distribution of residual following regression with the original value of nursing personnel cost per patient day
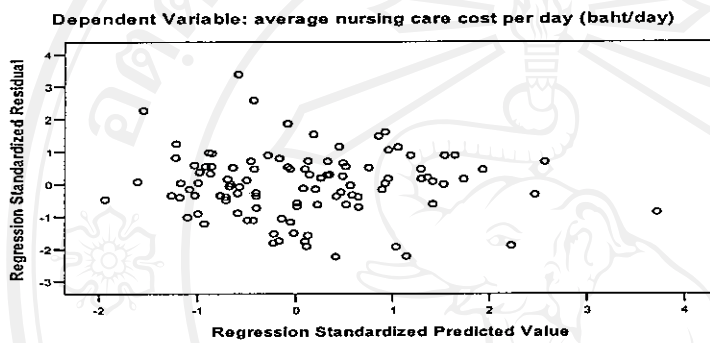

Figure 5. Scatterplot of regression standardized predicted value of nursing personnel cost per patient day and regression standardized residual.
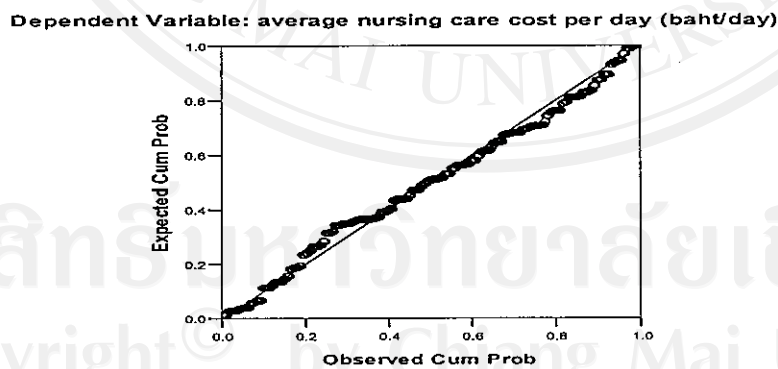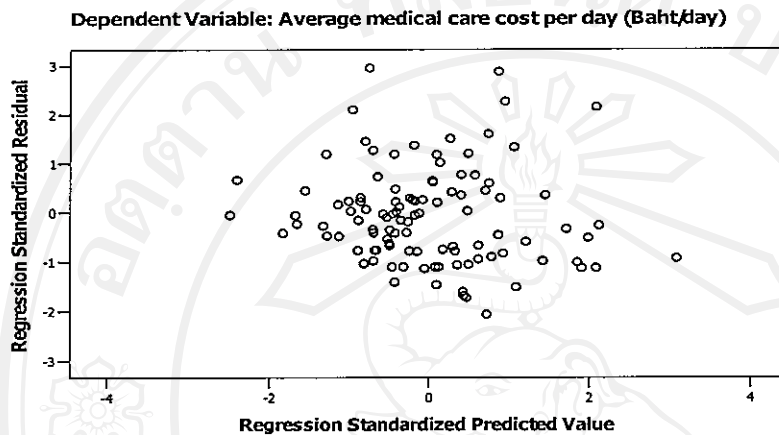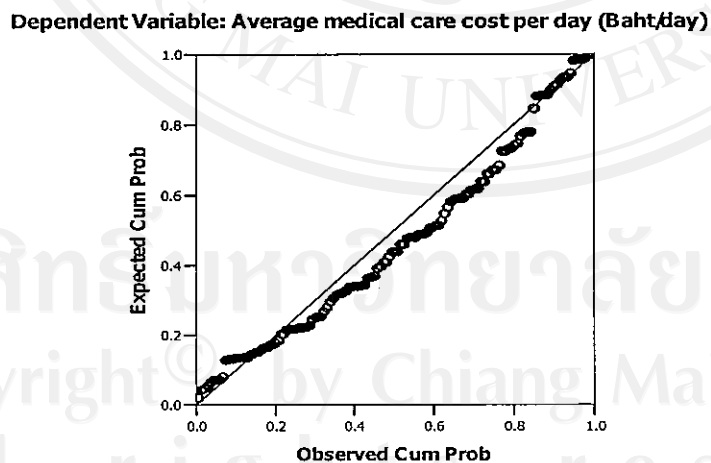

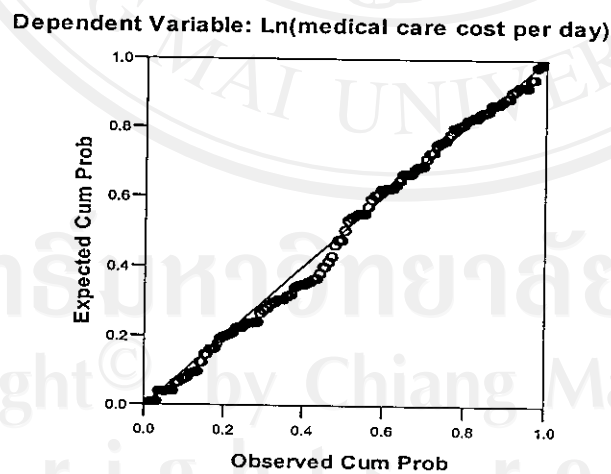*Figure 6.* Normal probability plot of regression standardized residual following regression with nursing personnel cost per patient day (dependent variable) and the average ratio of RN to patient, the average ratio of RN to other nursing staff, ICU types and day of patient admission (independent variables)

2. The distribution of residual following regression with the original value of medical care cost per patient day

Figure 7. Scatterplot of regression standardized predicted value of original medical care cost per
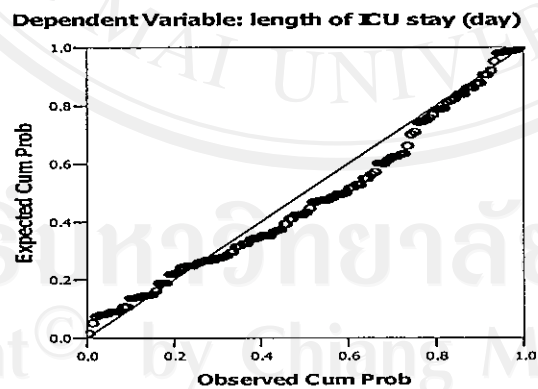
patient day and regression standardized residual.

Figure 8. Normal probability plot of regression standardized residual following regression with

original value of medical care cost per patient day (dependent variable) and severity of

Illness, groups of lymphocyte count and the average ratio of RN to patient (independent

variables).

3. The distribution of residual following regression with logarithmically transformed medical care cost per patient day
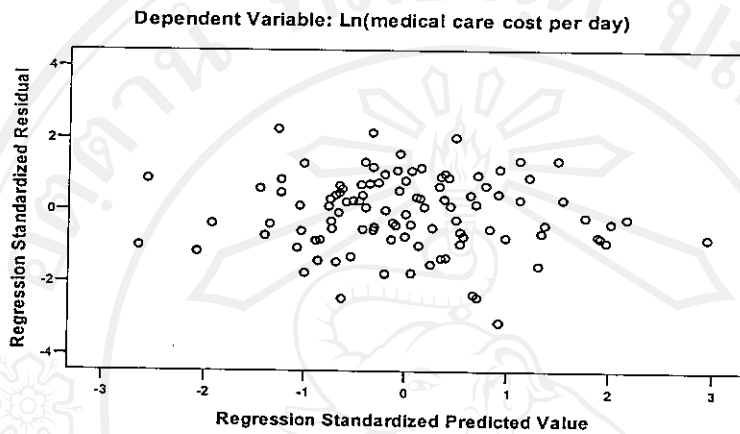
Figure 9. Scatterplot of regression standardized predicted value of logarithmically transformed medical care cost per patient day and regression standardized residual.

Figure 10. Normal probability plot of regression standardized residual following regression with logarithmically transformed medical care cost per patient day (dependent variable) and severity of Illness, groups of lymphocyte count and the average ratio of RN to patient (independent variables).

4. The distribution of residual following regression with the original value of
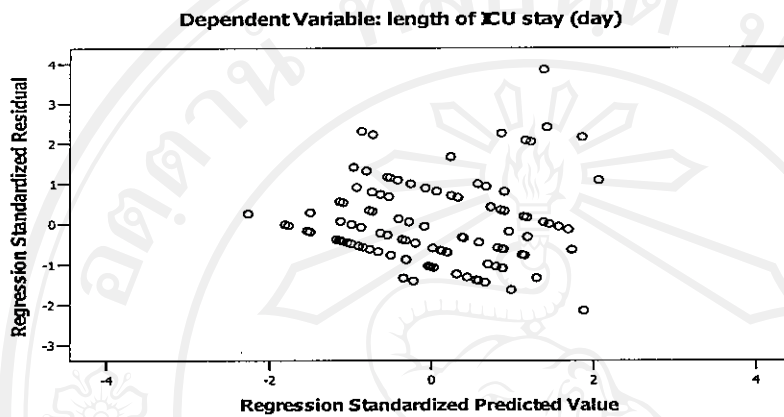
length of ICU stay

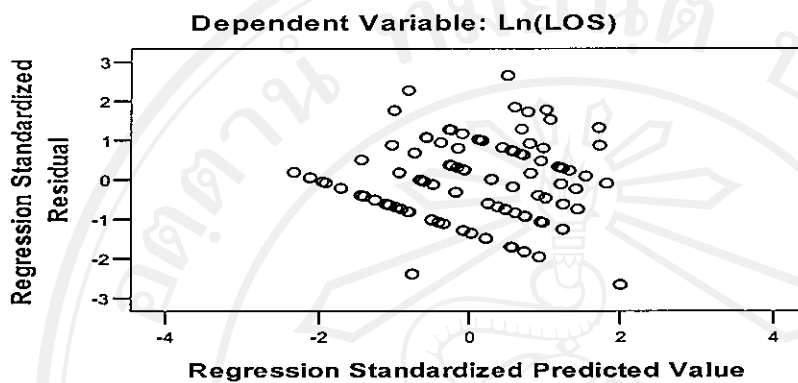*Figure 11.* Scatterplot of regression standardized predicted value of original length of ICU stay and

regression standardized residual.

Figure 12. Normal probability plot of regression standardized residual following regression with

original value of length of ICU stay (dependent variable) and types of ICU, severity of

Illness, the average ratio of RN to patient, groups of albumin level, groups of lymphocyte

counts, day of patient admission and time of patient admission (independent variables).

5. The distribution of residual following regression with logarithmically transformed length of ICU stay

Figure 13. Scatterplot of regression standardized predicted value of logarithmically transformed length of ICU stay and regression standardized residual.
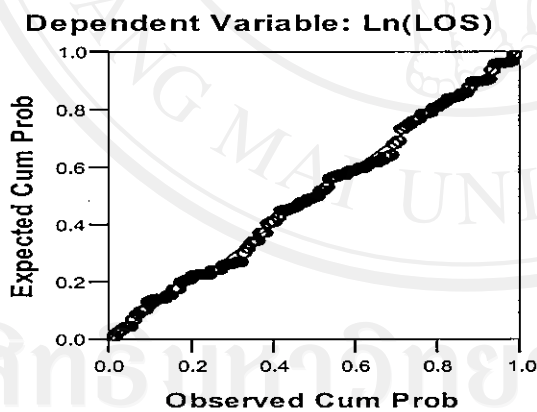

Figure 14. Normal probability plot of regression standardized residual following regression with logarithmically transformed length of ICU stay (dependent variable) and types of ICU, severity of Illness, the average ratio of RN to patient, groups of albumin level, groups of lymphocyte counts, day of patient admission and time of patient admission (independent variables).

Appendix N

List of Experts

1. List of Translators of the Instruments

    1.1 Associate Professor Dr. Pikul Boonchuang, Department of Medicinal Nursing, Faculty of Nursing, Chiang Mai University, Thailand

    1.2 Lecturer Dr. Sirirat Leelacharas, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand

    1.3 Lecturer Dr. Suparat Wangsrikhum, Department of Surgical Nursing, Faculty of Nursing, Chiang Mai University, Thailand

2. List of Validators of the Instruments

    2.1 Associate Professor Waraporn Pannavalee, Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Thailand

    2.2 Assistant Professor Dr. Sudarat Sittisombut, Department of Surgical Nursing, Faculty of Nursing, Chiang Mai University, Thailand

    2.3 Lecturer Dr. Nuttamon Vuttanon, Department of Surgical Nursing, Faculty of Nursing, Chiang Mai University, Thailand

    2.4 Mr. Terdsak Chaiwana, Center Diagnostic Laboratory, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai University, Thailand

    2.5 Ms. Siriporn Pornputasa, The Head Nurse of Medical Intensive Care Unit, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai University, Thailand

CURRICULUM VITAE

Name   Ms. Petsunee Thungjaroenkul

Date of Birth   November 21, 1968

Place of Birth   Chiang Mai, Thailand

Education   1999   Master of Economics, Chiang Mai University,

Chiang Mai, Thailand

1995   Master of Science (Applied Statistics),

Chiang Mai University, Chiang Mai, Thailand

Professional Experience

1998 to present   Lecturer, Department of Nursing

Administration, Faculty of Nursing,

Chiang Mai University,

Chiang Mai, Thailand

1991-1998   Registered nurses, private ward, nursing

service in Maharaj Nakorn Chiang Mai

University Hospital

Grants   Research grant and funding from the Ministry of Education,

Thailand and UMAP program to study at the University of

Alberta, Edmonton, Canada (August, 2004 to November, 2004)

and University of Michigan, United States (January, 2005 to

July, 2005)