DEMAND PROJECTION FOR SIMPLE KNEE ARTHROPLASTY AND ESTIMATION OF THE OPPORTUNITY COSTS AND WAITING TIME AMONG PATIENTS AND FAMILIES IN THAILAND

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A Thesis Submitted in Partial Fulfillment of the Requirements

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Management

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และระยะเวลาคอยผ่าตัดของผู้ป่วยและครอบครัวในประเทศไทย

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ภาวะข้อเข่าเสื่อมเป็นโรคที่พบบ่อยโรคหนึ่งในผู้สูงอายุ อัตราการเกิดโรคของผู้ป่วยยังไม่แน่ชัด การเกิดภาวะข้อเข่าเสื่อมนี้ทำให้เกิดภาวะทุพพลภาพได้ ซึ่งกระทบต่อสภาวะจิตใจของผู้ป่วยและญาติ ในปัจจุบันนี้ การบรรเทาภาวะข้อเข่าเสื่อมมีหลายวิธี ตั้งแต่การรับประทานยา การเพิ่มประสิทธิภาพกล้ามเนื้อ และการผ่าตัด ซึ่งวิธีการผ่าตัดเป็นวิธีที่มีประสิทธิภาพมากที่สุดในปัจจุบัน แต่ในปัจจุบันจำนวนแพทย์ทางข้อเข่าเทียมยังมีน้อยอยู่ ยังไม่สามารถกระจายได้ทั่วถึง ทำให้ในปัจจุบันผู้ป่วยมีระยะเวลาการรอที่ยาวนานโดยขึ้นอยู่กับจำนวนที่ผู้ป่วยเข้ารับการรักษา ซึ่งในการรอนั้นทำให้เกิดค่าใช้จ่ายที่เพิ่มขึ้น ทำให้เกิดต้นทุนค่าเสียโอกาสของผู้ป่วยและครอบครัว วัตถุประสงค์งานวิจัยนี้เพื่อดูระยะเวลารอเฉลี่ยของผู้ป่วยในโรงพยาบาล และต้นทุนค่าเสียโอกาสของผู้ป่วยจากการรอคอย และหาปัจจัยที่ทำให้เกิดต้นทุนที่สูงต่อผู้ป่วย วิธีการศึกษาวิจัยโดยแบ่งเป็น2ส่วน ส่วนที่1 สอบถามทางแพทย์ผู้เชี่ยวชาญด้านข้อเข่าเทียมและส่วนที่2สัมภาษณ์ผู้ป่วยที่ได้รับการผ่าตัดข้อเข่าเทียมแล้ว จากนั้นรวบรวมข้อมูลทั้งทางด้านเพศ อายุ ดรคประจำตัว ระดับการศึกษา รายได้ ต้นทุนค่าเสียโอกาสแล้วหาความสัมพันธ์ โดยใช้วิธีหาความสัมพันธ์โดยใช้โปรแกรม StataV.12 โดยใช้ระดับความน่าเชื่อถือที่ 1%, 5% และ 10% พบว่าปัจจัยที่มีผลต่อต้นทุนค่าเสียโอกาสได้แก่ระยะเวลารอที่เพิ่มขึ้น การศึกษาของผู้ป่วย(ซึ่งผู้ป่วนที่มีการศึกษาในระดับตั้งแตปริญญาขึ้นไปมีต้นทุนค่าเสียโอกาสเพิ่มสูงมากถึง11,841บาท) รวมทั้งผู้ที่จ้างผู้ดูแลผู้ป่วยจะเสียค่าใช้จ่ายเพิ่มขึ้นถึง4406บาท และผู้ที่ครอบครัวมีรายได้สูง จากข้อมูลดังกล่าวแสดงว่าถ้าทำการเพิ่มจำนวนแพทย์ไม่ว่าจะเป็นการฝึกอบรมระยะสั้นหรือระยะยาว จะสามารถลดต้นทุนค่าเสียโอกาสของผู้ป่วยได้

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CHAWIN SUWANCHATCHAI: DEMAND PROJECTION FOR SIMPLE KNEE ARTHROPLASTY AND ESTIMATION OF THE OPPORTUNITY COSTS AND WAITING TIME AMONG PATIENTS AND FAMILIES IN THAILAND. ADVISOR: TOUCHANUN KOMONPAISARN, Ph.D., CO-ADVISOR: ASSOC. PROF. JIRUTH SRIRATANABAN, M.D., Ph.D., 61 pp.

Gonarthrosis is the one of most common disease in the elderly. The incidence of Gonarthrosis is not enough document. Gonarthrosis can cause the disability to the patient and cause the psychological problems to patients and families. Nowaday, the method for treatment are medicaatment, muscle strengthening, and surgical treatment. In the present, the arthroplasty is the most common treatment. In this present, waiting time for operation is still long, depended on number of patients. For this research, I separated to 2 parts. First, interview the arthroplasty surgeons and second interview the patients. Then collected the data and regression with StataV.12 and significant level are 1%, 5% and 10% Results the factor that influence to the opportunity cause are waiting time, education level (higher than bachelor degree is 11841 baht) and paid for caretaker (4406 baht) and high income family. From this research, if we can reduce waiting time, we can get rid of opportunity cost for patient and family.

Field of Study: Health Economics and Health Care Management

Academic Year: 2013

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Advisor's Signature ....

Co-Advisor's Signature ....

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CHAPTER 1

INTRODUCTION

Problems and Background

In Thailand, the elderly population increased every year. According to Pattama et al (al). the number of elderly (age > 65) in 2005 is 6.4 million (10.3% of All population),   they predicted that in 2035, Thailand may have elderly as many as 15.9 million populati-on (25.1% of all population).

From Wipan(1999)(วิพรรณ ประจวบเหมาะ), the increased ratio for elderly is increase more than ratio of population. She predicted that the number of elderly in 2020 is 300 percent   more than   the number of elderly in 1980. She explained that the increase rate of Baby-boom child-hood in the part, and the decrease rate of death. The elderly (age>75 year old) is 700,000 in 1990 and will be 2 million in 2020.

Table1-1 shown predicted the number of elderly in Thailand from 1970 to 2050

Scale	1970	1980	1990	2000	2010	2020	2030	2040	2050
1)No. of Pop-ulation (x1,000)	35,745	46,718	55,558	60,495	64,568	67,798	70,735	72,678	72,969
60+	1,175	2,527	3,719	5,245	6,955	10,207	14,897	18,861	20,489
65+	1,107	1,649	2,413	3,501	4,758	6,755	10,220	14,023	15,860
70+	616	922	1,477	2,142	3,097	4,141	6,482	9,512	11,637
75+	313	484	803	1,149	1,729	2,367	3,600	5,532	7,475
2)Projection of Population(%)									
60+	-	-	42.7	107.6	175.2	303.9	489.5	646.4	710.8
75+	-	-	65.9	137.4	257.2	389.0	643.8	1403.0	1444.4
3)Ratio with Child&Elderly									
<15	46.2	40.0	31.8	25.2	21.6	20.1	19.0	18.7	18.6
60+	4.8	5.4	6.7	8.7	10.8	15.1	21.1	26.0	28.1
65+	3.0	3.5	4.3	5.8	7.4	10.0	14.4	19.3	21.7
4)Ratio disability									
Male	9.8	4.5	4.9	5.8	7.1	10.4	15.9	21.3	23.8
Female	9.0	5.4	6.0	7.3	8.9	12.9	19.2	25.7	28.8
Total	104.1	83.2	62.7	51.1	47.9	54.2	66.8	80.8	87.5

Adapt from Napaporn Chayovan (Napaporn Chayovan) 1998. Calculated from data provided in United Nations (1996) World Population Prospects. The 1996 Revision. P794 and The Sex and Age(Napaporn Chayovan) Distribution of the World Populations, the 1996 Revision. P788, 789

Figure1-1 shown ratio between population, child and elderly
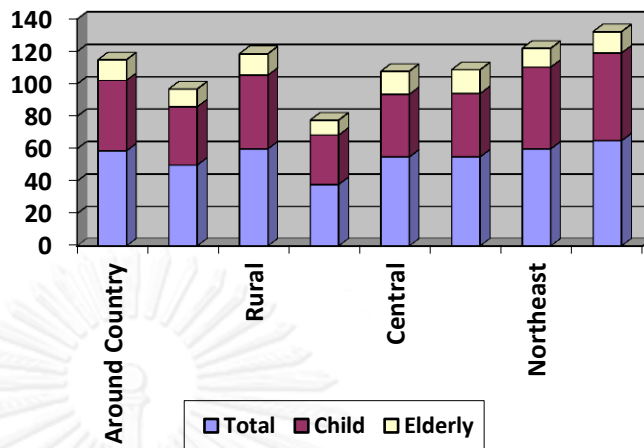
From Wipan(1999(วิพรรณ ประจวบเหมาะ)

Figure1-2 shown the percentage of elderly and child from 1990 to 2020
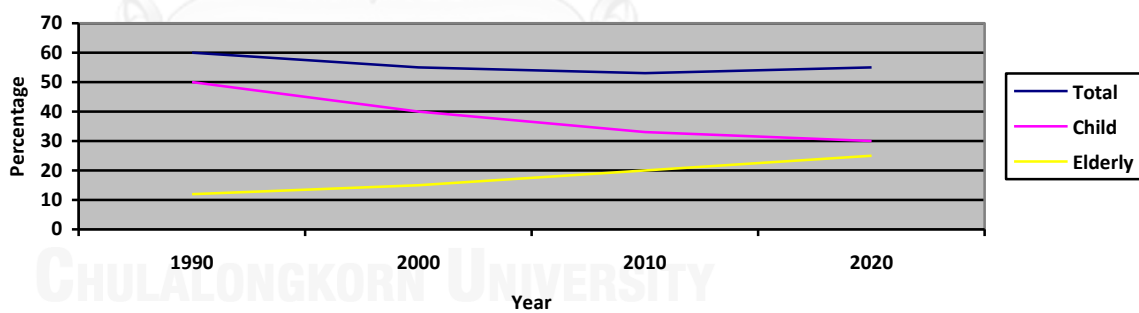
From Wipan(1999)(วิพรรณ ประจวบเหมาะ)

Figure1-3 shown population in Thailand in different period
(the number shown in 100,000)
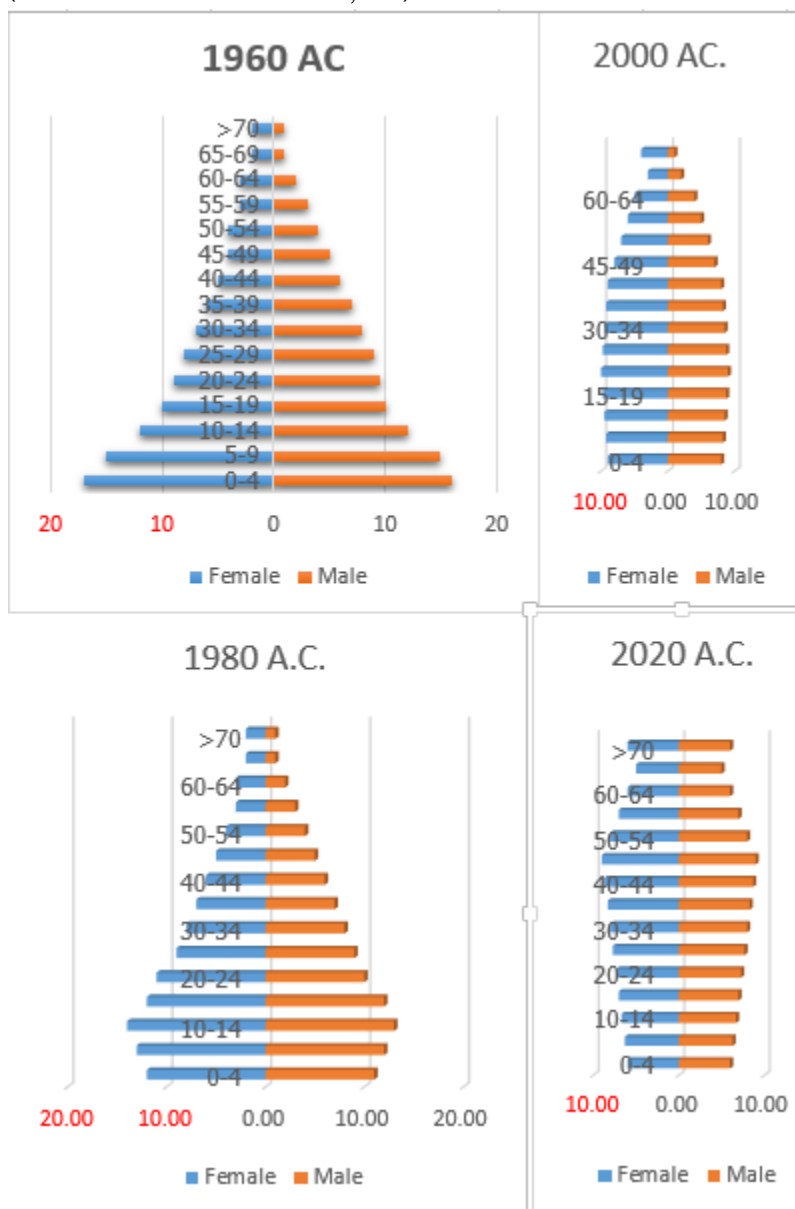
From Wipan(1999)(วิพรรณ ประจวบเหมาะ)

One common disease of the elderly is pain in knee joint called Osteoarthritis of knee (Gonarthrosis, OA knee). Some elderly can resolve by taking medicine. Some cannot. This group has go through the operation. This group they cannot do their daily of life activities. That is disturb and ignore to elderly and their families.

The common of indication for surgery is age > 65, severe pain and cannot resolve by full medications, use crutches or cane.

In Thailand, there are only 70 Arthroplasty surgeons around the country. It means there are not enough for the elderly. The time that the patient has to wait for surgery depend on hospital. For example in Vajira hospital is waiting for 3 months, King Mongkut Medical Center is waiting for 6 months and Siriraj hospital is waiting for 1 years. The elderly that waiting operation they always cannot help themselves and the member of family have to leave their jobs to take care of them. It means that families cannot have full effectiveness for earning the money. That make problem for their socioeconomics and mind.

According from Coyte et al. (1994), they conclude that the waiting time for knee operation in USA and Canada are only 3 weeks and 8 weeks respectively. In Thailand there are no accurate number. If the Royal College of Orthopaedic Surgeon of Thailand and Hip-Knee society can produce more arthroplasty surgeon. The waiting time will be decreased.

Thailand Profile

Thailand or the Kingdom of Thailand is located in the mainland of Southeast Asia, these area was called Indo-chine and Malay,

Boundary: East with Lao, and Cambodia, South with Malaysia , West with Myanmar and North with Myanmar and Lao

Thailand has area about 513,115 square kilometers, the size is 50 largest of the world and third largest of Southeast Asia. The Indonesia is 1,910,931 Square Kilometers and Myanmar is 676,578 square kilometers, the country size is nearly as equal as Spain 505,370 square kilometers. Thailand is divided into 77 provinces 878 districts and 7,255 sub-district.

Thailand has population has population about 65.93 million and increase in 0.8% each year. In 2010-2011, the distribution of population is about 132.1 per square kilometers. The number of population in Bangkok is about 8.25 millions. The distribution in urban is less than rural area (the distribution in urban approximate 44.1% and rural area around 55.9%).

Gross Domestic Product (GDP) per capita is 10,849 US Dollar in 2011. The GDP is increased approximate 5.5% each year. We can called that Thailand is the new industrial country because the main income come from export and tourism. Thailand has well-known area are Pattaya, Phuket, ChiangMai and Bangkok (From IMF, 2009)(Fund)

From 1781, Thailand used Absolute Monarchy system. After 1932, Thailand was changed to the Democracy. Democracy in Thailand consisted of Parliament and Senate. Bangkok is the capital city of Thailand.

According to the World Health Organization (WHO)'s Global Health Observatory(development February 2013), in 2000 life expectancy at birth in Thailand is 63.3 years for males and 73.5 years for female and in 2009 life expectancy at birth in Thailand is 66 years for males and 74 years for female respectively. Infant mortality rate and under-5 mortality rate (per 1000 live births) decreased from 12.3 in 2010 to 12 in 2012 and from 14.3 in 2010 to 13.9 in 2012 respectively. The prevalence of HIV is 13 per 1,000 adults aged between 15 to 49 years. The prevalence of Tuberculosis is 189 per 100,000 population.

Total Health Expenditures represented about 4.3% of Gross Domestic Product (GDP); 75.8% came from public sources and 24.2% from private sectors. Physician density was 2.98 per 10,000 population. (World bank)(2012)

Table1-2 Health indicators of Thailand

Indicator	2008	2009	2010	2011	2012
Mortality rate; under-5 (per 1,000 live birth)	13.9	13.5	13	13.7	13.2
Completeness of infant death reporting	50.82	-	83.78	53.83	52.99
Completeness of total death reporting	86.56	-	66.26	81.05	78.77
Mortality rate; adult; female (per 1,000	104.1	102.55	101.01	109.54	

female adults)					
Mortality rate; adult; male (per 1,000 male adults)	211.66	208.25	204.85	213.27	
Mortality rate; infant (per 1,000 live births)	12	11.6	11.2	11.8	11.4
Life expectancy at birth; female (years)	77.13	77.25	77.39	77.44	
Life expectancy at birth; male (years)	73.61	73.77	73.93	74.01	

Sources World Bank (2012)

Health Care service in Thailand

The Thai health care system is pluralistic with the mixture of public and private providers, and the Ministry of Public Health (MoPH) is giving the response to provide health care services through public health facilities. MoPH is providing health care services including protective, preventive, curative and rehabilitative care to people according to social objectives that set by National Health Security Office (NHSO). Since 2002, Thailand has been established Universal health care system. The Universal health care is providing in three programs; the Civil Servant Medical Benefits Scheme (CSMBS) for civil servants and their families, Social Security System (SSS) for private sector employees, and Universal Coverage Scheme for all other Thai Nationals. Other from public health facilities, local NGOs such as Thai Health Promotion Foundation and Thai Red Cross Society are providing other fragments of health care services.

Health Care Financing in Thailand

Before 1997, the share of health care spending by private sector (private insurance, traffic insurance, the employer's benefit for employees, out-of pocket, the Non-profit Institute Serving for Households) was greater than public sector (the Civil Servant Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), the State Enterprises, the Public Independent Organization.

From 1997, Thai Government forced private section entry to Social Security Scheme, the share of health care spending by public was increased.

After 2002, Government launched the Universal Coverage Scheme, the share of health care spending by public section was increased significantly

Figure1-4 Proportion of Government and Non-Government Financing, 1994-2008
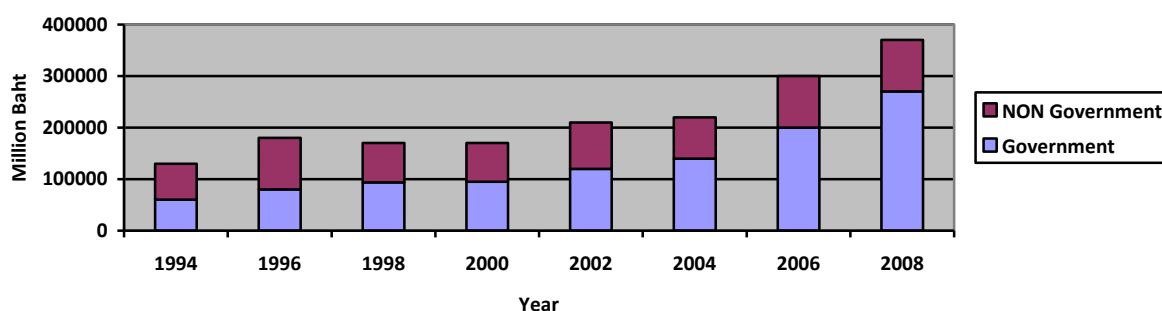
From World bank,(2012)

The Universal Coverage Scheme shared around 15% from 2002 to 2004 and increased to 24.1% in 2008. The CSMBS, the State Enterprise and the Public Independent Organization had their proportion of about 9.7% of the Total Health Expenditure (THE) in 1994 but increased to 18.8% in 2008. The CSMBS shared of the health expenditure 14.9% while the State Enterprise and the Public Independent Organization had 2.7% and 1.2% respectively.

Figure1-5 Total Health Expenditure by Financing source, 1994 to 2008
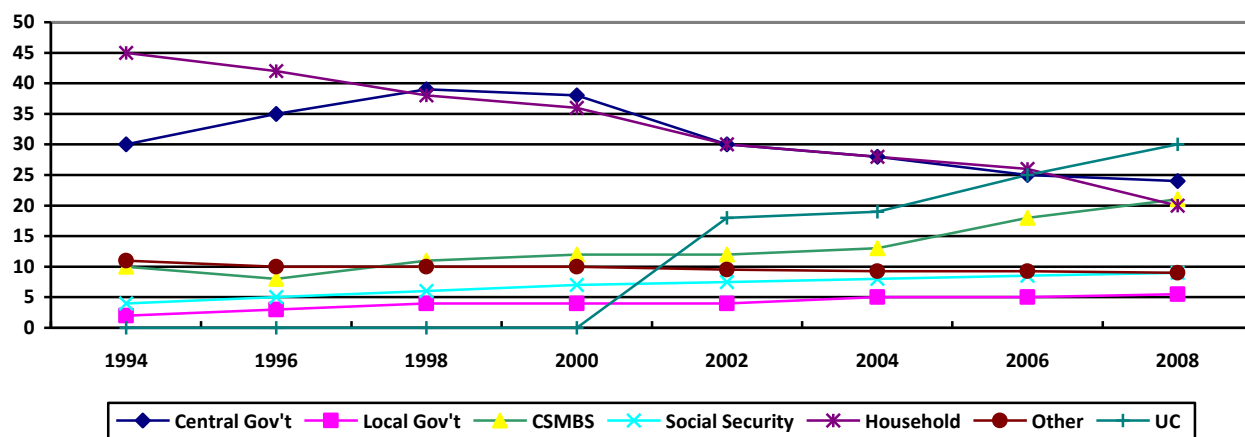
From World bank,(2012)

In 2005, after Thai Government completely set the Universal Coverage scheme, the Shared of health care by public sections was stable. The Figure shown the greatest shared was ministry of Public Health was 29%, secondly was the Universal Coverage Scheme 27%, Follow with the Civil Servant Medical Benefit Scheme and the Social Security Scheme were 19% and 12% respectively.

Figure1-6 Expenditure by Public Financing agent, 2005
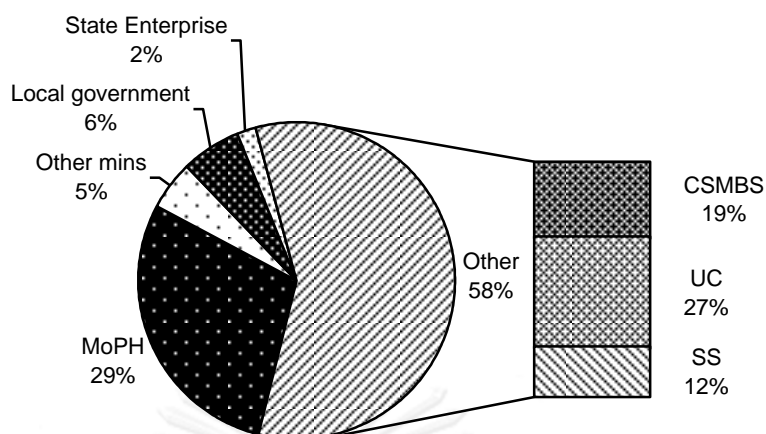
From World bank,(2012)

Health Care Provider in Thailand

The Thai Medical Council and Medical schools can produce 1,200 physicians per year. Only 800 physicians are continuous training for specialist. Thai Medical Council reported that Thailand has 42,890 physicians in 2010. In these group, there are 25,285 specialists (59%) that can divided to Medicine, Family Medicine, Pediatrics, surgeons, Gynecologist, Orthopedist, and other were 22%, 18%, 11%, 11%, 8%, 5% and 25% respectively.

The physicians when finished their training. They leaved from public sector and turned to private sector. There are imbalance and distribution of specialists. Prannarunothai S et al. predicted that Thailand will lack lots of specialist in the next 10 years.

Table 1-3: how lack of the physician in next 10 years

	Anesthesiologist	Orthopedic surgeon	Surgeon	Neurological Surgeon	Pediatrician
Number of Specialist(Now)	2,348	1,732	3,943	641	3,242
Number of Specialist(Require)	786	1,038	2,182	239	2,484
Number of Specialist(Require) (Next 10 year)	2,810	2,136	4,718	854	2,969
Number of Specialist (Next 10 Years)	1,462	2,070	2,863	514	3,496
Over/Lack(+/-)	-1,348	-66	-1,855	-340	527
	Ophthalmologist	Otolaryngologist	Obstetrician	Medical geneticist	Family Medicine
Number of Specialist(Now)	849	1,034	2,467	8,005	12,130
Number of Specialist(Require)	665	688	1,813	4,596	N/A
Number of Specialist(Require) (Next 10 year)	1,235	1,179	2,363	10,687	14,476
Number of Specialist (Next 10 Years)	1,204	1,209	2,492	5,543	N/A
Over/Lack(+/-)	-31	30	129	4,044	N/A

From: http://www.tcijthai.com/tcijthai/view.php?ids=2507(al.)

Conceptual framework

Research design divided to 2 parts

1. The first part, I collected the data from the University, Regional, and Provincial hospital. The data are the number of arthroplasty surgeon, number of junior surgeons, number of scrub nurses, number of technical staffs, number of Ortho beds, duration of admission, percentage of complication, mortality rate, and re-admission rate.

   The waiting time is collected from the average of waiting time in that hospital

2. The second part, I collected the data from the University, Regional, and Provincial hospital. The data are underlying disease of the patient, technology, pain threshold of the patient, expected from the patient and relative, co-payment, welfare of the patient, direct and indirect outcome and cost of private surgery. After collect the data, I will found the correlation between independent variables and dependent variable.

Research Questions

- Can we find the number of patient with Gonarthrosis that can access to the health facility.
- Can we estimate the waiting time and opportunity cost of each patient in Thailand?
- Are number of arthroplasty surgeon, number of junior surgeons, number of scrub nurses, number of technical staffs, number of Ortho beds, duration of admission, percentage of complication, mortality rate, and re-admission rate the factor for waiting time?
- Are underlying disease of the patient, technology, pain threshold of the patient, expected from the patient and relative, co-payment, welfare of the patient, direct and indirect outcome and cost of private surgery the factor disturb to the opportunity cost of patients.

Research Objectives

- How can we decrease waiting time for surgery and how much opportunity cost loss of the patient?

Scope of the study

- This study, we study in the patient that can access to total knee arthroplasty in University, Provincial and Regional hospital. We scope in the patient that were operated in 2010-2011 by Arthroplasty surgeons.

Definition

- Arthroplasty surgeon : the Orthopedic surgeon that trained in fellowship training in Thailand or Abroad.
- Total Knee Arthroplasty : change knee joint with prosthesis without other special devices, for example long stem etc.
- Waiting time: time start from the patient and surgeon agreed for surgery to the day that patient admit for surgery.
- Opportunity costs: total summary of cost that patient or relative paid for take care the patient, for example paid for care taker, for took the patient to hospital, etc.
- number of patient with Gonarthrosis that can access to the health facility
- Scrub nurse: nurse who has a skill to assisted in case
- Expectation : the period between the patient and relative predicted their waiting time and their real waiting time.
- Underlying disease : for example Diabetes, Hypertension, Old cerebrovascular disease, or Dyslipidemia
- Controllable : can control under medical limitation

Hypothesis

- Number of arthroplasty surgeon, number of junior surgeons, number of scrub nurses, number of technical staffs, number of Ortho beds, duration of admission, percentage of complication, mortality rate, and re-admission rate are the factor for waiting time.
- Underlying disease of the patient, technology, pain threshold of the patient, expected from the patient and relative, co-payment, welfare of the patient, direct and indirect outcome and cost of private surgery are the factor disturb to the opportunity cost of patients.

Expected sign:

From the first hypothesis, the variable that predicted the expected sign negative is

- Number of Arthroplasty surgeons: more surgeons, the waiting time will less
- Number of Scrub nurses: more nurses, the waiting time will be less
- Number of Ortho bed: more available bed, surgeon can admit the patient easily
- Number of Operation room because if we can increase the number of operating room, the waiting time will be decrease.

From the first hypothesis, the variable that predicted the expected sign positive is

- Percentage of Complication: more complication, the available bed will be decrease then the waiting time of other patient will be increased. Then the available bed for another patient will be decreased.
- Mortality rate: more mortality rate, more complications was happened. Then the available bed for another patient will be decreased.
- Re-admission rate, these factors are influence in available of bed and operation room. If these variable are increased the waiting time will be increase.

From the second hypothesis, the variable that predicted the expected sign negative is

- Expectation : If the shorter expectancy, the opportunity cost was decreased
  From the second hypothesis, the variable that predicted the expected sign positive is
- Age: the older tends to pay more for opportunity costs, because the older usually more disability, then the relative must pay more for take care.
- Underlying disease: if more severe underlying disease, tends loss more opportunity cost
- Pain threshold: if the patient can tolerance more pain, the opportunity cost will higher. Because severe degeneration (means if prolonged of disease, the degenerative change more severity) ,

- Co-payment: if higher co-payment, the patients tend to tolerance. They didn't want to pay for operation ,
- Private cost: if cost of private hospital high, the patients tend to tolerance and wait. Then they prefer to wait in lists more than go to private surgery. The opportunity cost must be increased.,
- Duration of disease: more degenerative change,
- Waiting time : waiting time increased, patients loss more money,
- Patient education: higher education tend to loss more opportunity cost. Because the higher education must have income more than lower education. If they cannot work the opportunity will higher,
- Relative education : higher relative education, they was help the patient more comfortable. they want to pay more for take care the patient.
- Patient outcome: the cost that paid for care taker.

Expected Benefits

- If we can produce or train more arthroplasty surgeon in the future, the waiting time will be decreased and the opportunity cost will be decreased too.

CHAPTER 2

Review Literatures

Projection of elderly in Thailand

The Office of the National Economic and Social Development Board (development February 2013) reported that the rate of elderly (age >60 years old) are increasing every year. They predicted that in the future, Thailand will become aging society. Correlate with the report from Pattama et al., they found that the number of elderly (age >65 years old) is 6.4 million (10.3% of all population) in 2005 and it will be increased into 15.9 million (25.1% of all population in 2035.

Chantapong et al. concluded from report from United Nations. In the next 10 years (2020), the elderly in Thailand will increased from 4.4 million to 8.9 million in 2000 and 2020 respectively.

The Office of the National Economic and Social Development Board divided the elderly into 3 groups

- Good ability elderly (60-69 years old), this group is approximate 50% of all elderly. This group has ability in labor market
- Ability elderly (70-79 years old), this group cannot work in labor market but they can help themselves in their daily life activities.
- Disability elderly (more than 80 years old), this group cannot help themselves in their daily life activities.

This report explained that the percentage of non-communicable disease (for example Degenerative change, Cancer, Alzheimer, Diabetes mellitus or Hypertension, etc.) is increased from 27% of any disease (in 1990) to 43% of any disease (in 2010). It means the number of degenerative changes patient is increase   every year.

On the other hand, the number of family member is decrease from 5.2 people (in 1980) to 4.4, 3.8 and 3.5 (in 1990, 2000, and 2010 respectively). The number of nuclear family increase from 25.1 (in 1980) to 29.6 (in 2000). And the elderly trend to stay single in these 12 years. The elderly trend to stay alone from 3.6% (of all elderly) (in 1994) to 7.5% (in 2006). From all reasons the elderly tends to stay alone. We can early improve   their quality of life. They are necessary for doing their

daily life activities.

Elderly situation in the World

(http://service.nso.go.th/nso/data/02/wld_pop47.html)

The world population is increased significantly. In 2000, the world population is approximate 6070.6 million and will be increased to 7,851.4 million in 2025. Similar with projection of population of Thailand, the world population will be aging society.

The ratio between elderly and working age is highest in Europe. Contrast from the African countries, the ratio between elderly and childhood is lowest.

The countries that has maximum elderly are Italy, Japan, Greece, and Germany

Table 2-1 shown the number of population in the world and in Thailand from 2000-2025

(x1000 units)

YEAR	World Population (%)				Thai Population (%)			
	Total	0-14 YO	15-59 YO	>60 YO	Total	0-14 YO	15-59 YO	>60 YO
2000	6,070,578	30.1	59.9	10.0	62,237	24.7	65.9	9.4
2005	6,453,627	28.3	61.3	10.4	64,765	23.0	66.7	10.3
2010	6,830,282	27.0	61.9	11.1	67,042	21.2	67.1	11.7
2015	7,197,247	26.1	61.6	12.3	69,056	20.2	66.0	13.8
2020	7,540,238	25.2	61.2	13.6	70,821	19.0	64.2	16.8
2025	7,851,455	24.2	60.8	15.0	72,288	18.0	62.0	20.0

From : การคาดการประมาณประชากรของไทย พ.ศ.2543-2568 สำนักงานคณะกรรมการพัฒนาเศรษฐกิจและสังคมแห่งชาติ World Population 2002. United Nations

Table 2-2 Shown Population structural and distribution of population in each regional of the world in 2003

			2000-2003 A.C.		
			Reproductive rate	Death/1000	Life Expectancy(yrs.)
World	29	10	2.7	9	65
Europe	16	21	1.4	11	74
Italy	14	25	1.2	11	79
Greece	15	24	1.3	10	78
Germany	15	24	1.4	11	78
Switzerland	16	23	1.4	10	79
North America	21	16	2.1	0	77
Onesia	25	14	2.3	8	74
Africa	42	5	4.9	15	49
Latin America	31	8	2.5	6	70
Asia	29	9	2.3	8	67
Japan	14	25	1.3	8	82
Singapore	21	11	1.4	5	78
China	23	10	1.8	7	72
Malaysia	33	7	2.9	5	73
Philippines	36	6	3.2	5	70
Thailand	21	9.4	1.7	6.6	66.8

From : World population 2002, Population Division, United Nations

Elderly Situation in Thailand

Social situation

The elderly is increased but the working age is decreased. The new born is decreased too. The elderly tends to stay alone or the couple tends to stay together. The social situation in Thailand, the working age usually send their children to stay with their parents (elderly). These children have not enough skill for take care the elderly and can cause the violent to the elderly.

Economic situation

Due to the working age in Thailand has a main responsibility for paying tax. In the future, if Thailand has change to elderly society, the tax that can collect will be decreased.

Health Situation
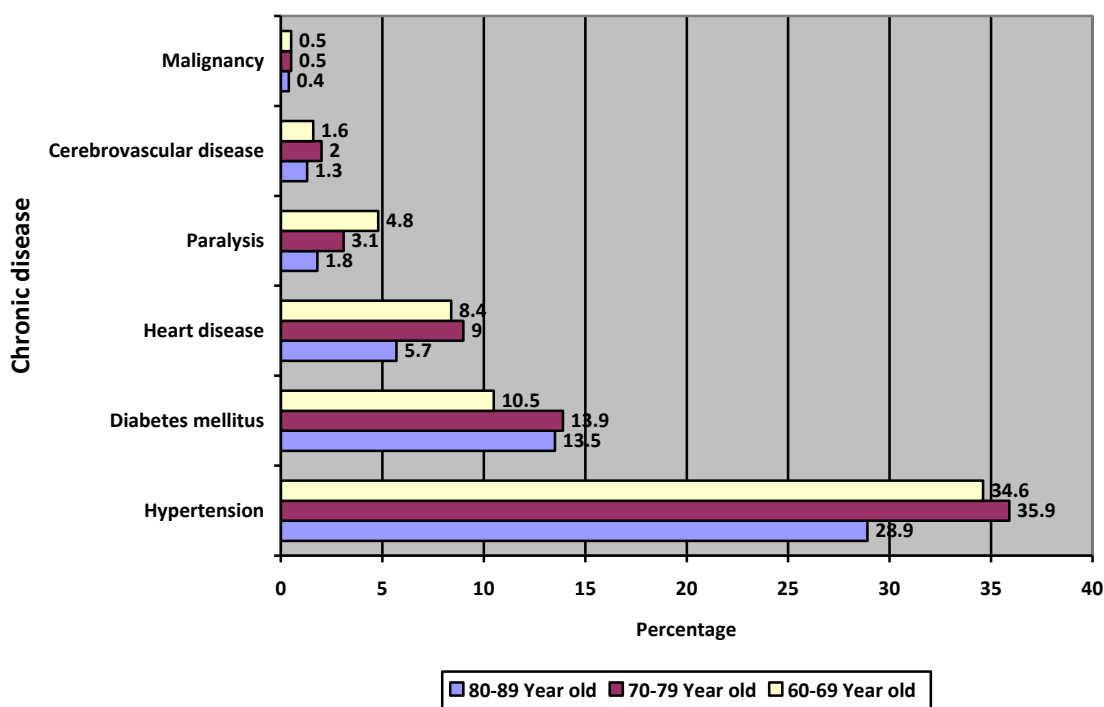
From รายงานสถานการณ์ผู้สูงอายุไทย พ.ศ. 2550, มูลนิธิสถาบันวิจัยและพัฒนาผู้สูงอายุไทย
, แผนภูมิที่ 19, หน้า 27(มูลนิธิสถาบันวิจัยและพัฒนาผู้สูงอายุไทย)

The elderly has increased the incident of chronic disease and disability.
Utai Sukviwatsirikul (2013) (Sukviwatsirikul 2013)

Problems in Elderly

In physical: the motion will be decreased, easily for fracture, degenerative change, slow response from brain, and disability.

In Psychology: depression, boring, stress, irritability, delirium, easily for accident

In social status: stay alone because of disability and limitation. they feel neglected, hopeless and suicidal attempt.
(อำไพขนิษฐ์ สมานวงศ์ไทย)

Disability problems in Thailand

Uthaitip et al (2009(al Jan-Apr, 2009)) found that the disability of elderly is increased from age group. They divided into 3 groups: ability to diary life activities, ability work in home, and ability to urinary and fecal incontinent.

Diability	Limit in Dairy Life Activities	Limit in Housework	Urine/Fecal incontinence
Male (n=9,419)			
60-69 Years old	2.0 (1.6-2.7)	35.4 (33.0-37.9)	14.8 (12.7-17.2)
70-79 Years old	4.3 (3.4-5.5)	54.7 (51.9-57.5)	21.6 (18.8-24.8)
>80 Years old	14.2 (11.4-17.6)	76.8 (72.7-80.5)	29.2 (24.1-34.8)
Total	4.5 (3.9-5.2)	47.1 (44.8-49.4)	18.9 (16.5-21.5)
Female (n=9,953)			
60-69 Years old	2.6 (1.9-3.5)	51.2 (48.2-54.2)	25.1 (22.3-28.1)
70-79 Years old	7.5 (6.3-8.8)	71.5 (68.7-74.0)	30.8 (27.2-34.5)
>80 Years old	15.7 (12.6-19.3)	89.0 (86.0-91.4)	42.0 (37.0-47.2)
Total	6.3 (5.4-7.3)	63.8 (61.3-66.1)	29.6 (26.6-32.8)
Total			
60-69 Years old	2.3 (1.9-2.9)	43.8 (41.5-46.2)	20.3 (18.2-22.5)
70-79 Years old	6.1 (5.3-7.0)	64.1 (62.1-66.1)	26.8 (24.0-29.7)
>80 Years old	15.1 (13.1-17.3)	83.9 (81.5-86.1)	36.7 (32.6-40.9)
Total	5.5 (4.9-6.1)	56.3 (54.3-58.2)	24.8 (22.5-27.3)

The underlying of the patients cause the disability of the patient in the table below

	% of Chronic Paralysis	% of Subacute Paralysis	Odds ratio
Cardiovascular disease*	32 (4.2)	64 (2.0)	2.19
Other Heart disease*	52 (6.8)	112 (3.4)	2.05
Hypertension*	171 (22.2)	429 (13.1)	1.9
Pulmonary disease** (exc. Asthma)	23 (3.0)	59 (1.8)	1.68
Kidney disease***	19 (2.5)	37 (1.1)	2.22
Diabetes mellitus*	91 (11.8)	243 (7.4)	1.68
Eye disease*	158 (20.5)	329 (10.0)	2.32
Blindness***	52 (6.8)	23 (0.7)	10.27
Ear disease*	42 (5.5)	66 (2.0)	2.81
Hearing loss*	69 (9.0)	57 (1.7)	5.57
Osteoarthritis of knee*	238 (30.9)	720 (22.0)	1.59
Back pain**	150 (19.5)	538 (16.4)	1.23
Seizure*	9 (1.2)	8 (0.2)	4.84
Alzheimer*	42 (5.5)	48 (1.5)	3.89
Hemiparesis*	102 (13.3)	24 (0.7)	20.74
Weakness*	92 (12.0)	79 (2.4)	5.5
Armless/legless*	5 (0.7)	-	-
fingerless/Toeless***	8 (1.0)	6 (0.2)	5.73
Stiffness*	27 (3.5)	7 (0.2)	17.01
Scoliosis*	33 (4.3)	12 (0.4)	12.21

สุทธิชัย จิตะพันธ์กุล (1996)(จิตะพันธ์กุล 1996) (การสำรวจสภาวะสุขภาพ ครั้งที่2 พศ. 2539หน้า 128-141)

From the table we found that the incidence of Osteoarthritis of knee is 30.9% of chronic disability patients and 22% of unchronic disability.

Diagnotic criteria for Gonarthrosis (From Insall & Scott Surgery of The Knee 4th ed)

Changes involving articular cartilage damage

Abnormal bone formation

Reactive changes in synovial membrane

Pathologic synovial fluid

Surgical Criteria (Campbell Operative Orthopaedics 11th ed. P1000-1019)

Age > 65

Severe pain and cannot resolve by full medications

Use crutch or cane

Surgical treatment options

- Arthroscopic Surgery : Miller et al(Miller GK 1986) followed up for 31 months, they found that the patients are better for 4 in 5 cases
- Osteochondral grafts : Bayne et al(Bayne O 1985) found that the patient is better outcome for 1 from 6 patients.
- High Tibial Osteotomy : better for early stage, Koshino(T 1982) followed up for 61 months. The patients are better for 35 from 37 knees
- Core decompression : Mont et al found that only 36 % is worsen compared with 75% for nonoperation
- Unicompartment Knee Arthroplasty : Marmor et al found that the patients are better for 89% for single compartment lesion
- Total knee arthroplasty : for advanced stage of arthrosis. Bergman and Rand found that patients are better for 87%

Waiting Time

If we can reduce the period of waiting time, the patient can help their daily of life activities and reduce care from their relatives. From the report of Bachrach-Lindstrom M(2008) found that if the surgeon can reduce the waiting time for 239

days, the patients can recovery for 15%, 21% and 80% in 3, 6 and 12 months respectively.

According from Comas M et al 2010(Comas M 2010), if the patients finished their operation for one side, the contralateral side can extended their surgery for 50% in 15 months.

Luigi Siciliani et al (2007) found the correlation between waiting time and the factors are number of surgeons, number of junior surgeon, number of scrub nurse, number of bed, period of admission, complications, mortality rate, and readmission rate.

The correlation between opportunity cost and waiting time, Jeremy Hurst, et al, found that the factor influence for the opportunity cost are patient condition, technology, threshold, expectation, co-payment, healthcare coverage, and private cost surgery.

- Luigi Siciliani et al.(2007)(Luigi Siciliani 2007) was publish the model for prediction the waiting time and factors that affected to waiting time are number of arthroplasty surgeons, number of junior surgeons, number of scrub nurses, number of technical staffs, number of Ortho beds, duration of admission, percentage of complication, mortality rate, and re-admission rate.

- The correlation between opportunity cost and waiting time, Jeremy Hurst, et al created model for finding the factors that influence to opportunity cost. They found that the factors are underlying disease of the patient, technology, pain threshold of the patient, expected from the patient and relative, co-payment, welfare of the patient, and cost of private surgery.

CHAPTER 3

RESEARCH METHODOLOGY

Research Designs

Devided to 2 parts

Part 1: Collected data from the hospital and Arthroplasty surgeons

Part 2: Interview the data from the patients

Part 1: Collected data from the hospitals and Arthroplasty surgeons

Observation and Measurement

The Cross-sectional retrospective design is used to study about number of patients and number of total knee arthroplasty cases. The operation is performed between January 2011 and December 2012.

Definition

Dependent variable:

Waiting time: time start from the patient and surgeon agreed for surgery to the day that patient admit for surgery.

Independent variable:

Number of Arthroplasty surgeons: number of arthroplasty surgeon in that hospital.

Number of Scrub nurses: number of scrub nurse that can assisted in total knee replacement case

Number of Ortho bed: percentage of arthroplasty bed and orthopaedic bed

Number of Operation room: number of operation room that available for total knee arthroplasty case

Percentage of Complication: percentage of complication that need admission.

Mortality rate: percentage of death patient during admission

Re-admission rate: percentage of patient that admitted from post-operative complications.

Study area

This study conducted in Thailand. Focused on University hospital, Regional hospital, and Provincial hospital. The public hospital in Thailand has more than 100 hospitals but the hospital that has full-time arthroplasty surgeons is about 25 hospitals.

Sample Size Determination

Collected the data from all of the hospitals I Thailand that Arthroplasty surgeons are full-time working.

Data collection

Study design

The Cross-sectional retrospective design is used to study about patient with total knee arthroplasty. The operation is performed between January 2011 and December 2012.

The hospital of choice is the hospital that has full time Arthroplasty surgeon(s)

- Primary data: collected from the phone call interview. Asking about age, sex, underlying disease of the patient, technology, pain threshold of the patient,

expected from the patient and relative, co-payment, welfare of the patient, and cost of private surgery

- Secondary data: collected from hospital. Finding the data from the medical record. Looking for the total knee arthroplasty cases that have operated between January 2011 and December 2012.

Quantitative data:

The quantitative data was collected by researcher using structured questionnaires. Random sampling method is used in data collection.

Part 1 and 2

These two parts is collected from medical records in the hospital that has full-time arthroplasty surgeon.

Qualitative data:

Qualitative data was collected from the Arthroplasty surgeons with in study hospital by conducting In-depth interviews. And collected from the patients about the expectation from the waiting time, and family status.

OLS Model

$$Y_{waittime} = \beta_0 + \beta_1 X_{Sur} + \beta_2 X_{scrub\_n} + \beta_3 X_{bed\_per} + \beta_4 X_{or}$$

$$+ \beta_5 X_{com\_per} + \beta_6 X_{mortal\_per} + \beta_7 X_{re\_per} + \varepsilon$$

Table3-1 : Definition, Abbreviation, type, and expected sign of hospital

Definition variable	Abbreviation	Type of Variable	Expected sign

Number of Arthroplasty surgeons	Surg	continuous	-
Number of Scrub nurses	Scrub_n	continuous	-
Number of Ortho bed	bed_per	continuous	-
Number of Operation room	Or	continuous	-
Percentage of Complication	com_per	continuous	+
Percentage of Mortality rate	mortal_per	continuous	+
Percentage of Re-admission rate	re_per	continuous	+

Table 3-2: table of variable definition

Number of Arthroplasty	The number of arthroplasty surgeon in study hospital
Number of scrub nurse	The number of scrub nurse in study hospital
Number of ortho bed	Number of arthoplasty beds devided by number of bed in orthopedics ward
Number of Operation room	The number of arthroplasty-operation rooms in study hospital
Percentage of complication	The number of complication divided by number of cases in percent
Percentage of mortality	The number of death cases divided by number of cases in percent
Percentage of re-admission	The number of re-admission cases divided by number of cases in percent

Part 2: Interview the data from the patients

Observation and Measurement

The Cross-sectional retrospective design is used to study about patient with total knee arthroplasty. The operation is performed between January 2011 and December 2012.

Study area

This study conducted in Thailand. Focused on University hospital, Regional hospital, and Provincial hospital. The public hospital in Thailand has more than 100 hospitals but the hospital that has full-time arthroplasty surgeons is about 25 hospitals.

Sample Size Determination

The sample size for this study is calculated based on Yamane(1967) formula.

$$n = \frac{Nz^2pq}{Nd^2 + z^2pq}$$

If we assume z=2 (1.96 for the 95% level of significant), then

$$n = \frac{N}{1 + Nd^2}$$

n = sample size

N = population size (12726)

d = precision (0.1)

z = reliability coefficient

p = proportion of the target population utilize care (assuming that 50%)

q = 1-p

$$n = \frac{12726}{1 + 12726(0.1)^2}$$

$$n = \frac{12726}{128.26} = 99.22$$

the sample size is calculated based on the total number of patients that operated TKA in 2011. According to the data from the Office of Policy and Strategy, Ministry of Public Health. There is a total 12,726 cases that operate for total knee arthroplasty.

Quantitative data:

The quantitative data was collected by researcher using structured questionnaires. Random sampling method is used in data collection.

Part 3

This part is collected from phone call interview from the patient or relative. According to calculation from this equation, the sample size for this study is 99. I collected the data from 125 patients because a regression model is better to analyze with more observations. Some data are not completed because the patients refused to answer the opportunity cost and family income.

Qualitative data:

Qualitative data was collected from the Arthroplasty surgeons with in study hospital by conducting In-depth interviews. And collected from the patients about the expectation from the waiting time, and family status.

Expected Benefits

- If we can produce or train more arthroplasty surgeon in the future, the waiting time will be decreased and the opportunity cost will be decreased too.

OLS Model

$Y_{opcost} = \beta_0 + \beta_1 X\ age + \beta_2 X\ sex + \beta_3 X\ noUnder\_dz + \beta_4 X\ Control\_dz + \beta_5 X\ uncon\_dz + \beta_6 X\ Gap\_time + \beta_7 X\ Co\_pay + \beta_8 Xuc + \beta_9 XSS + \beta_{10} XCSMBS + \beta_{11} X\ private + \beta_{12} X\ period + \beta_{13} X\ Wait\_time + \beta_{14} X\ Primary + \beta_{15} Xsecond + \beta_{16} Xbachelor + \beta_{17} Xmaster + \beta_{18} X_{ploytech} + \beta_{19} X\ re\text{-}primary + \beta_{20} X\ re\text{-}secondary + \beta_{21} X_{re\text{-}bachelor} + \beta_{22} X\ re\text{-}master + \beta_{23} X\ re\text{-}phd + \beta_{24} X\ income + \beta_{25} X\ outcome + \beta_{26} X\ self + \beta_{27} X\ relative + \beta_{28} X\ care\ taker + \varepsilon$

Table 3-3: Definition, Abbreviation, type, and expected sign of patients

Definition variable	Abbreviation	Type of Variable	Expected sign
Age	Age	Continuous	+
Sex	Sex	Dummy	+/-
Underlying disease	nounder_dz	Dummy	+
	control_dz		
	uncon_dz		
Expectancy	Gap_time	Continuous	-
Co-payment	Co_pay	Continuous	+/-
Welfares	UC	Dummy	+/-
	SS		
	CSMBS		
Cost of Private Surgery	Private	Continuous	+/-
Period of disease	Period	Continuous	+
Waiting time	Wait_time	Continuous	+

Patient education	Primary Secondary Bachelor Master PhD Polytech	Dummy	+
Relative education	Primary Secondary Bachelor Master PhD Polytech	Dummy	+
Family income	Income	Continuous	+/-
Direct cost	Outcome	Continuous	+
Who care	Self Relative Caretaker	Dummy	+

Table 3-4: table of variable definition

variables	Description
Sex	1 if male, 0 if female
Underlying disease	1 if no underlying disease, 0 if any underlying disease
Controllable underlying disease	1 if controllable, 0 if other conditions
Gap_time	Time between expected time and real waiting time
Co_pay	The payment that patient have to pay
UC	1 if Universal coverage, 0 if other

CSMBS	1 if Civil servant medical benefit scheme, 0 if others
Private	Cost of private surgery
Period	The real waiting time
secondary	1 if secondary school, 0 if others
Master	1 if master degree, 0 if others
bachelor	1 if bachelor degree, 0 if others
Polytech	1 if polytech, 0 if others
Re_sec	1 if relative secondary school, 0 if others
Re_bac	1 if relative bachelor degree, 0 if others
Re_mas	1 if relative master degree, 0 if others
Re_phd	1 if relative Phd, 0 if others
Income	Patients family income
outcome	The care taker cost
Self	1 if patients' self take care, 0 if others
caretaker	1 if caretaker, 0 if others

CHAPTER 4

RESULTS

This chapter will describe the data. The distribution of demographic, socio-economics characteristics, waiting time and opportunity costs of patient. And the type, characteristics and average waiting time of hospitals.

Part 1: Collected data from the hospitals and Arthroplasty surgeons

Demographic Characteristics of the Hospital

Table4-1 Characteristics of the hospital

Variable	Number of patients	%
Type of Hospital		
University hospital	58.0	58.0
Regional hospital	32.0	32.0
Provincial hospital	10.0	10.0
Total	100.0	100.0

According from the table, the University hospital has a highest number of patients is about 58%. Secondly is regional hospital, it is about 32%. Because of the patients reliable in University hospital. The facility in University or regional hospital is

available more than provincial hospital.

Table 4-2: Demographic Characteristics of the Arthroplasty Surgeons

Table 4-2: Demographic Characteristics of the Arthroplasty Surgeons

Variable	Number of Arthroplasty Surgeons	%
Type of Hospital		
University hospital	49.0	75.4
Regional hospital	12.0	18.4
Provincial hospital	4.0	6.2
Total	65.0	100.0

According from the table, the University hospital has a highest number of arthroplasty surgeons is about 75.38%. Secondly is regional hospital, it is about 18.46%. Because of the facility in University or regional hospital is available more than provincial hospital.

Demographic Characteristics of the Patients

Table4-3 Demographic Characteristics of the Patients

Variable	Mean (Std.Dev)	Min	Max
Age	68.5 (8.5)	51.0	84.0
Number of Family member	3.66 (1.2)	1.0	7.0

Total Observation=100			

According to table , age of the study population ranges from 51 years old to 84 years old with the mean age of 68.45 years old. The distribution is correlated with the incident rate of osteoarthritis. The incidence of osteoarthritis is start from 50 years old or peri-menopausal period. The average of family member is 3.66 members (that ranges from 1 to 7 members). The number of family member is correlated with report from the Office of the National Economic and Social Development Board

Characteristics of the hospital

Table4-4 Characteristics of the hospital

Variable	Frequency	%
Type of Hospital		
University hospital	14.0	60.9
Regional hospital	7.0	30.4
Provincial hospital	2.0	8.7

According from the table, the majority hospital in this study is University hospital with about 60.87%. Secondly is regional hospital, it is about 30.43%. Because of the distribution of the arthroplasty surgeon is in the university hospital or regional

hospital. The facility in University or regional hospital is available more than

provincial hospital.

Table4-5 Shown the number of each variable

Variable	Mean (Std.Dev)	Min	Max
Number of Arthroplasty surgeon in hospital	2.8 (2.2)	1.0	10.0
Number of scrub nurse in hospital	9.0 (6.1)	2.0	30.0
Number of operation room in hospital	3.0 (2.4)	1.0	10.0
Percentage of Arthroplasty bed	23.7 (19.2)	3.3	100.0
Post-operative Complication rate	6.0 (9.6)	0.0	46.0
Post-operative mortality rate	1.0 (4.0)	0.0	4.0
Re-admission rate	4.6 (5.7)	0.0	27.0
Cost of Private surgery	217,608.7 (61567.9)	0.0	250,000.0
Average waiting time in hospital*	184.9 (171.4)	35.0	660.0

*Average waiting time in hospital: **mean of waiting time in each hospital (calculated from 30 Sample in each hospital)**

Table4-5 shows the average number of arthroplasty surgeon in a hospital is 2.826. The minimum and maximum in number of arthroplasty surgeon is 1 and 10 respectively. This number is variable depended on the hospital. The university hospital has more arthroplasty surgeon because they have to teach and training for medical student, orthopedic resident and fellow arthroplasty. Contrast from the regional hospital and provincial, the regional hospital has only 1-2 arthroplasty surgeons in a hospital. Same as Provincial hospital, the number of arthroplasty surgeon is only 1 surgeon in a hospital. They are difference from the University hospital. The provincial and regional hospital has a small number of patients because they are not too realized in provincial and regional hospital.

The average number of scrub nurse is 9 nurses. The minimum and maximum in number of scrub nurse is 2 and 300 respectively. This number is variable depended on the hospital. The university hospital has more scrub nurse because they have to teach and training for nurse students, and they have to work in another fields. Contrast from the regional and provincial hospital, scrub nurse has many work and busy. Then some nurses were trained for assisting in operation room.

The minimum and maximum number of operation room in hospital is 1 and 10 rooms in a week. The average number is 3 rooms. The operation room is variable

depended on the number of arthroplasty surgeon. Normally, the arthroplasty surgeon will has one room in one week. But some hospitals have different policies. These arthroplasty surgeons can use operation more than one day in a week. Then the average number of operation room is higher than the number of arthroplasty surgeons. The operation room doesn't use only total knee arthroplasty. It uses for other arthroplasty or some traumatic operation. The number of arthroplasty case per day, should correlate with available of arthroplasty bed. The percentage of arthroplasty is various. There are different in number of bed in each hospital. The average arthroplasty bed is 23.69% in orthopedic ward. The minimum and maximum number of arthroplasty bed is 3.33% and 100% respectively. The maximum number of arthroplasty bed is 100% because there is only one orthopedic surgeon in that hospital. And he/she appoints only arthroplasty cases.

The average post-operative complication is 6.043 cases per year. The minimum is no post-operative complication. The maximum post-operative complication is 46 cases. Post-op complication includes post-operative infection, malrotation of prosthesis, or post-operative foreign bodies. The maximum post-operative complication is highest only 2010. Because there problem is about sterile technique and incubator. When they can detect and adapt it, the infection problem was gone. Then the post-operative infection was high in only that year.

The average post-operative mortality rate is 1.043 cases. The minimum post-

operative mortality rate is zero cases. The maximum post-operative mortality rate is 4 cases. Due to patient's underlying disease. The post-operative mortality rate is pneumonia and sepsis.

The average re-admission rate is 4.565 cases. The minimum post-operative mortality rate is zero cases. The maximum post-operative mortality rate is 27 cases. Correlate with the high infection rate at 2010. That hospital has the highest cases in this study.

The average cost of private surgery is 217,608.7 baht per case. The minimum cost of private surgery is zero baht because there is no private hospital in that area or in that province. The maximum cost of private surgery is 250,000 baht per case. The cost of private surgery is higher in the big city such as Bangkok Metropolitan, Chiang Mai province, or Songkhla province. The price of cost of private surgery in big city is average 230,000 baht per case. The price of cost of private surgery in other city is average 180,000 baht per case. The cost of private surgery in this study is promotion package in each area of hospital.

The average waiting time in hospital is 187.86 days. The minimum and maximum average waiting time in hospital is 35 and 680 days. The less waiting time is in provincial hospital. And the more waiting time is in University hospital.

Part 2: Interview the data from the patients

Table4-6: characteristic of patients

Variable	Frequency	%
Gender		
Female	71.0	71.0
Male	29.0	29.0
Underlying disease		
No Underlying disease	15.0	15.0
Underlying disease (Controllable)	85.0	85.0
Underlying disease (Uncontrollable)	0.0	0.0

According to table, the majority, 71%, of the patients in the study are female while only 29% of them are male. The 85% of the patients have controllable underlying disease. Only 15% of them don't have underlying disease.

Socio-economics Characteristics of the patients

Table4-7 socio-economics characteristics

Variable	Mean (Std.Dev)	Min	Max
Income	56,570 (54481.4)	5,000.0	240,000.0
Change	4,003 (6,849.1)	0.0	50,000.0
Outcome	980 (2,960.9)	0.0	15,000.0
Opportunity cost	4,983 (6,910.3)	0.0	50,000.0

According to table, Maximum income of the study families is 240,000 baht per month and the minimum is 5,000 baht per month. The average income is 56,570 baht per month. The change of income when the patient has illness (indirect cost) is average 4,003 baht per month. The average outcome that the patient and their families have to spend is 980 baht per month. And the maximum outcome is 15,000 baht per month. The total opportunity cost of patient and their families is 4,983. And the maximum opportunity cost is 50,000 baht per month.

Table 4-8: Shown patients' health status and background

Variable	Frequency	%
Benefits or Welfare		
The Universal Coverage Scheme	44.0	44.0
The Social Security Scheme	11.0	11.0
The Civil Servants Medical Benefit Scheme	45.0	45.0
Patient's education	38.0	38.0
Primary School	34.0	34.0
Secondary school	2.0	2.0
Poly-technique	23.0	23.0
Bachelor degree	3.0	3.0
Master degree	0.0	0.0
Ph.D.		
Relative's education		
Primary School	9.0	9.0
Secondary school	4.0	4.0
Poly-technique	0.0	0.0
Bachelor degree	58.0	58.0
Master degree	28.0	28.0
Ph.D.	1.0	1.0
Who take care the patients		
Self take care	67.0	67.0
Relative	25.0	25.0
Caretaker	8.0	8.0

Table shows the socio-economic characteristics of the patients from this study population. Nearly 90% use the Civil Servant Medical Benefits Scheme and the Universal coverage. Only 11% use the Social Security Scheme. From these data the number of the patients that use the Social Security Scheme is low because the patients that use this scheme are working in private sector. They were hardly to get the vacation for 3months. Because postoperative patients have to rest, take care their wound and rehabilitation for 3months.

More than 70% of the patients' education is primary and secondary school. Because the compulsory education in the past is provide only primary school. The elderly that didn't work in public section or work in highly position in private section was unnecessary to study in higher level. The native elderly is poverty. They have to early leave the school for working or marriage. The others (less than 30%) are working in public section and work in highly position in private section.

In contrast, the patient's relatives are high education because the new compulsory education is provided education to secondary school. And the new generation tends to study bachelor degree or more. The majority of relative's education (87%) is bachelor degree or more.

There are 67% of patients take care themselves due to the osteoarthritis is

not seriously severity. They can help themselves in daily life activities. The others

(33%) must have relative or care taker.

Table4-9 shown average of period of disease

Variable	Mean (Std.Dev)	Min	Max
Period of disease	7.9 (4.7)	1.0	22.0
Waiting time	199.2 (178.1)	30.0	735.0
Gap time	146.2 (126.3)	12.0	555.0

The average duration of disease is 7.85 years. The minimum and maximum of

duration of disease of the patients in this study is 1 and 22 years respectively. The

maximum waiting time in this study is 735 days. And the average waiting time in this

study is 199.19 days. The average gap time in this study is 146.19 days and the

minimum and maximum of gap time for waiting Total knee Arthroplasty of the

patients in this study is 12 and 555 days respectively.

Figure 4-1 Shown the Average waiting time in each hospital(Y in days) and Hospital ID (X)
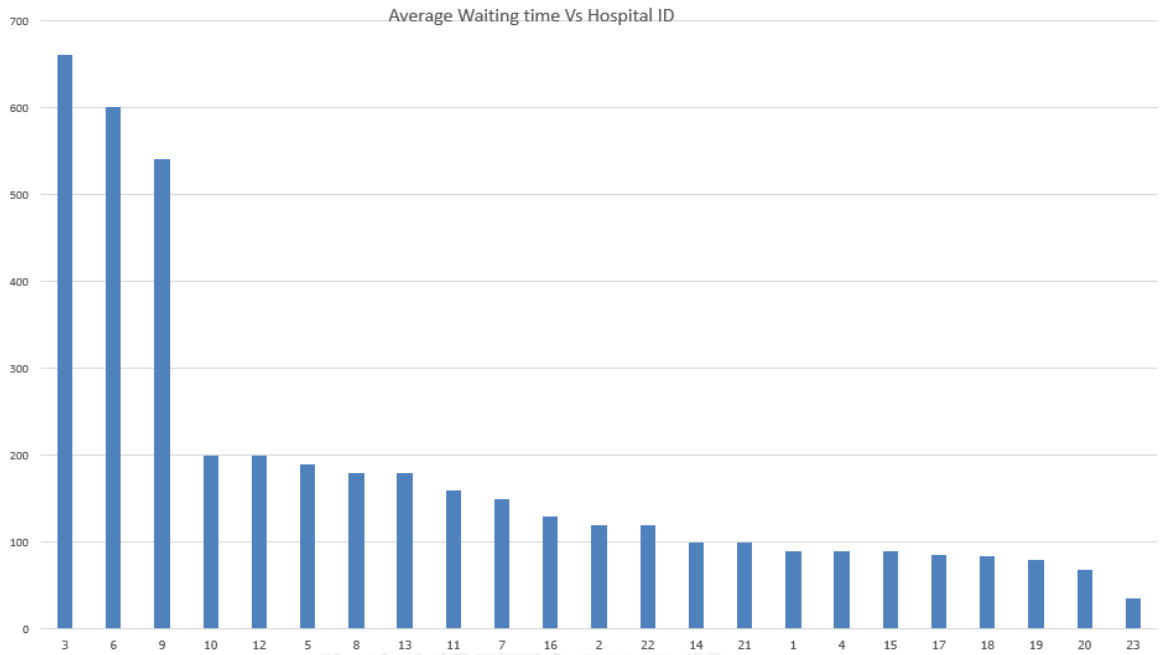
Average Waiting time Vs Hospital ID

Figure 4-2 Shown the average of opportunity costs in each hospital(Y in baht) and Hospital ID (X)

Opportunity cost Vs Hospital ID
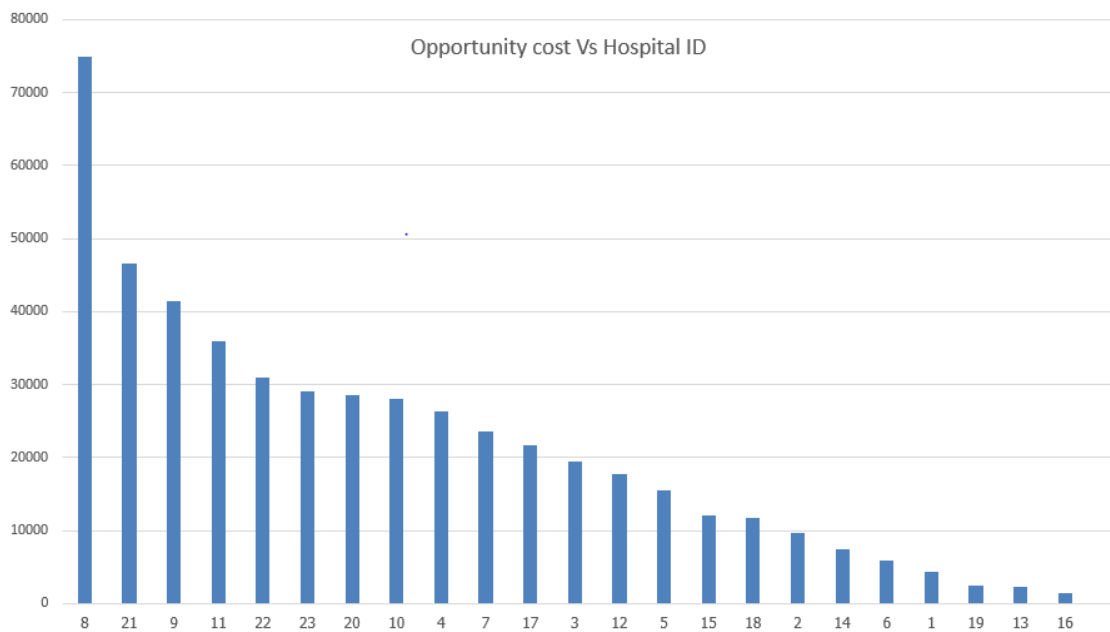
CHAPTER 5

DISCUSSION

This chapter will present the determinants of the choices of health facilities and the analysis from collected data. The regressions were run separately for the patients and hospital.

Quantitative results

We will discussion only for the significant results

Table5-1: Regression results about the opportunity costs with all variable

$$Y_{opcost}=\beta_0+\beta_1X\ age\ +\beta_2X\ sex\ +\beta_3X\ noUnder\_dz\ +\beta_4X\ Control\_dz\ +\beta_5X\ uncon\_dz$$

$$+\beta_6X\ Gap\_time\ +\beta_7X\ Co\_pay\ +\beta_8Xuc\ +\beta_9XSS\ +\beta_{10}XCSMBS\ +\beta_{11}X\ private\ +\beta_{12}X$$

$$period\ +\beta_{13}X\ Wait\_time\ +\beta_{14}X\ Primary\ +\beta_{15}Xsecond\ +\beta_{16}Xbachelor\ +\beta_{17}Xmaster$$

$$+\beta_{18}X_{ploytech}\ +\beta_{19}X\ re\text{-}primary\ +\beta_{20}X\ re\text{-}secondary\ +\beta_{21}X\ _{re\text{-}bachelor}\ +\beta_{22}X\ re\text{-}master$$

$$+\beta_{23}X\ re\text{-}phd\ +\beta_{24}X\ income\ +\beta_{25}X\ outcome\ +\beta_{26}X\ self\ +\beta_{27}X\ relative$$

$$+\beta_{28}X\ care\ taker\ +\varepsilon$$

Variable	Exclude: under_dz,	Exclude: benefits, relative-edu,	Exclude:benefit, under_dz, takecare	Exclude: age, sex,under_DZ, period, take care	Exclude: fam_memb, edu
Age	-122.44	-126.2554	-122.4497		-122.4497

	(126.5772)	(120.1971)	(126.5772)		(126.5772)
Male	895.8348	974.0553	895.8348		895.8348
	(1479.8232)	(1454.893)	(1479.823)		(1479.823)
Uc	218.8456			-216.2609	437.5723
	(2017.384)			(2150.165)	(2273.667)
CSMBS	-777.8847			-810.8012	-340.3124
	(1386.244)			(2194.068)	(2330.667)
under_dz		196.897			199.6078
		(1940.182)			(1945.025)
Period	193.525	176.3317	193.525		193.525
	(157.6835)	(153.0637)	(157.6835)		(157.6835)
wait_time	6.91633*	6.649851*	6.9163*	7.5203**	6.9161*
	(4.09197)	(3.976101)	(4.09197)	(3.7739)	(4.0919)
fam_memb	-16.7419	-48.46662	-16.7419	-16.7419	
	(702.5576)	(688.246)	(702.5576)	(702.5576)	
Secondary	1022.152	940.8574	-10818.9***	-10964.2***	
	(2023.582)	(1997.334)	(3811.775)	(3737.806)	
Bachelor	104.692	68.76331	-11736.3***	-11426.5***	
	(2111.384)	(2075.891)	(3809.451)	(3760.533)	
Master	11841.03***	11625.73***	11825.61***	11841.03***	
	(3936.59)	(3869.097)	(3839.097)	(3936.59)	
Polytech	9776.444**	9600.511**	-2064.586	-1803.711	
	(4881.801)	(4787.829)	(5791.875)	(5630.302)	
re_secondary	-2875.607		-2875.607	-2600.336	-2225.824
	(3865.801)		(3865.801)	(2474.207)	(3647.855)
re_bachelor	-1239.131		-1239.131	-136.2418	-1239.131
	(2770.272)		(2770.272)	(2474.207)	(2770.272)
re_master	-2109.83		-2109.83	-1441.775	-2109.83
	(2827.96)		(2827.96)	(2525.383)	(2827.96)
re_phd	-2587.046		-2587.046	-650.2853	-2583.0446
	(6866.397)		(6866.397)	(6324.581)	(6866.397)
Self	-951.2884	-300.3042			-951.2884
	(1863.605)	(1645.589)			(1863.605)
Caretaker	3841.989	4006.549			2890.701

	(2925.504)	(2834.977)			(2692.256)
Income	.04720***	0.047314***	0.0472***	0.04469***	0.0472***
	(0.01512)	(0.014923)	(0.01512)	(0.012668)	(0.01512)
co-pay	0.086804	0.089496	0.0868	0.08649	0.0868
	(0.0855)	(0.0844506)	(.08548)	(0.08289)	(0.0855)
gap_time	-1.5075	-1.69881	-1.5075	-0.8849288	-15074
	(4.9727)	(4.89950)	(4.9727)	(4.8606)	(4.97273)

*Note: *,**,*** indicate that the coefficient is statistically significant at 10%, 5%, and 1%*

level respectively

Waiting time variable:

Waiting time of the patients were asked and used as a continuous variable in this study. Waiting time variability is statistically significant on this study. The significant level is 99%. It means that when the longer of waiting time for 1 day, the opportunity cost was increased for 7.52 baht. From the regression showed that if the surgeon prolonged waiting time for surgery, the patients and their families have to lose opportunity cost for 17.52 baht. This result is correlated with our hypothesis that if the waiting time was increased, the opportunity cost was increased too.

The patients' education status variable

When we were run all of the patients' education variable to each level of education. We found that master degree were statistically significant. It means that the elderly with master degree were in high position in their work (both of public and private sector). They gain the high salary. From the regression found that the master degree patient has to loss their opportunity cost 11,841 baht higher than the patient with primary education. Then they cannot work in part-time, they loss their income

and loss highly opportunity costs. Contrast from the primary and secondary level. They were the housewives, farmers, or office maid. They didn't loss too much opportunity cost. And the bachelor degree group, they didn't work in the high position. They got the normal salary, then they didn't loss too much opportunity cost.

Income variable:

Income variable used as a continuous variable in this study. Income variability was statistically significant on this study. The significant level is 99%. Explained that when the patients' family got more income, they have to pay more for their patient. But the opportunity cost was not increased too much. Because the elderly didn't want more things. From regression if income increase for 1 baht, their opportunity cost will increased for 0.05 baht

Outcome variable:

Outcome variable used as a continuous variable in this study. Outcome variability was statistically significant on this study. The significant level is 90%. Explained that when the patients have to hire for care-taker. They have to pay more money. Then the outcome variable were significant. It mean that if the patient have to pay for caretaker for 1 baht, the patient or relative have to pay for care-taker for 0.55 baht

Table5-2: Regression results about the waiting time with all variable

$$Y_{waittime}=\beta_0+\beta_1 X_{Sur}+\beta_2 X_{scrub\_n}+\beta_3 X_{bed\_per}+\beta_4 X_{or}$$

$$+\beta_5 X_{com\_per}+\beta_6 X_{mortal\_per}+\beta_7 X_{re\_per}+\beta_8 X_{un}\ \beta_9 X_{region}+\varepsilon$$

Variable		Exclude: type	Exclude: bed_per
Region	-40.66535		-40.66535
	(137.6485)		(137.6485)
Province	-78.24105		-78.24105
	(218.0337)		(218.0337)
Surg	135.5793	139.447	135.5793
	(141.9657)	(131.0738)	(141.9657)
Scrub_n	6.5346	7.879368	6.5346
	(1.7798)	(15.05493)	(1.7798)
Bed_per	-.5316166	-.0553558	
	(4.1304)	(3.470771)	
Or	-174.7633	-187.4666	-174.7633
	(122.4826)	(107.3716)	(122.4826)
Pts_mon	4.928941	5.005677	4.928941
	(4.498799)	(3.987836)	(4.498799)
Com_case	-.73126	4.482025	.73126
	(32.19926)	(27.69845)	(32.19926)
Mortal_cas	-6.9852	-9.836121	-6.9852
	(32.44454)	(28.04884)	(32.44454)
Re_case	-27.80192	-30.299771	-27.80192
	(41.21283)	(35.41451)	(41.21283)
Private	.0002675	.0007185	.0002675
	(.0019287)	(.001392)	(.0019287)

The hospital variable:

From hospital variable, only type of hospital was dummy variable. Others were continuous variable. All variable were necessary for increase waiting time

because when the number of surgeon, number of arthroplasty bed, and number of operation room were increased, the waiting time should increase. And when the percentage of complication, percentage of mortality case and percentage of readmission case were decreased, the waiting time should increased. However, all these coefficient are not statistically significant, due to the sample is too small.

Qualitative results

In-depth interviews were conducts with 5 Arthroplasty surgeons from different provinces. The in-depth interviews focus on supply side. Results from the in-depth interviews were:

1. The special instrument for operation, the surgeons can borrow from the prosthesis company. The hospital was unnecessary for buying.

2. The number of scrub nurses was not a problem because the scrub nurse in hospital that can assist in case. They didn't have to specific train for nurse and when the surgeon wants the assistance, the prosthesis company will send the assistant to help in case.

3. The available of operation room were not a problem in regional and provincial hospital. Because the hospital didn't use all of the operation room in office hour. The available of operation room were the problem in university. They can correct it by giving the extra for the nurse, operation room staff and used the operation room at evening after office hour. The hospital can correct some extra from the patients and pay for staff.

4. The hospital got the profit from the prosthesis (about 20%) this amount of money, they can pay for operation room staff.

5. The available of bed was not the problem for regional and provincial hospital. They used the word "**infinity bed**" for surgeons. The problems were occurred in university hospital. But they can borrow bed from other sections or other departments.

6. All of the surgeon agree with my idea. If we can train the short course for total knee arthroplasty and hip arthroplasty, the complication will be decreased. They though unnecessary for training only fellow arthroplasty for support the supply side. Because other orthopedic surgeons have skill for operation. But they have to train for updated technology.

CHAPTER 6

CONCLUSION and RECOMMENDATION

In this chapter, we will present three parts: conclusion of the study,

recommendations, and limitations of the study.

Conclusion

This study aim to find the opportunity cost for the patient and family. They

have to wait for Total knee arthroplasty. In this study we study only in public sector.

Primary data were collected in March and April 2014 by using structured

questionnaires. For the research design, the cross-sectional, retrospective and

descriptive design is implied.

There are 100 patients in this study. The information on socio-demographic

characteristics, economics characteristic and opportunity cost were collected. The

regression models were applied to determine the opportunity cost.

There are 23 hospitals in this study. The information on hospital

characteristic, number of medical staff and facilities were collected. The regression

models were applied to determine the waiting time.

The major determinants of opportunity cost are age, sex, underlying disease

of the patient, technology, pain threshold of the patient, expected time from the

patient andrelative, co-payment, the welfare of the patient.

The major determinants of waiting time are number of arthroplasty surgeons, number of junior surgeons, number of scrub nurses, number of technical staffs, number of Ortho beds, duration of admission, percentage of complication, mortality rate, and re-admission rate.

In conclusion, the waiting time is increased opportunity costs. But the opportunity cost is changed depended on education of the patients. For decreasing the waiting time and opportunity cost, we should produce more arthroplasty surgeon or give the short courses for other orthopedic sections. The short courses will be decreased some post-operative complications, for example malrotation, infection.

Discussion

Many experts in arthroplasty suggested that we have two choices for decreasing waiting time:

1. We should produce more arthroplasty surgeon or give the short courses for other orthopedic sections. The short courses will be decreased some post-operative complications, for example malrotation, infection.

2.The arthroplasty surgeon can use the hospital facilities after office hour. They can use operation room, scrub nurses, patient bed that available in operation room.

Because the hospital can make profits from prosthesis. This profits, hospital can pay for the medical staff and electrical after the office hour. One expert will publish the article about how surgeon can make profit for hospital. He told that we can make the profit after office hour for 24% by don't collect any extra-money from the patients.

Limitations

This study is a cross-sectional retrospective study and we random only public hospital that finished the fellow arthroplasty. This results might not be generalized for all country. Because there are many public hospital that the arthroplasty cases are operated by other orthopedic section.

Another limitation is income of the patients and families. They may not be very reliable to tell the truth about income.

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APPENDIX

แบบสอบถาม

ส่วนที่1 โรงพยาบาล

โรงพยาบาล ....อำเภอ
.... จังหวัด ....

ประเภทของโรงพยาบาล .....โรงพยาบาลจังหวัด .....โรงพยาบาลศูนย์ .....โรงเรียนแพทย์จำนวน

แพทย์เชี่ยวชาญด้านข้อเข่าเทียมในโรงพยาบาล .... (คน)

จำนวนผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคข้อเข่าเสื่อมปี 2554-2556 .... (คน)

จำนวนผู้ป่วยที่ได้รับการผ่าตัดเปลี่ยนข้อเข่าเทียมปี 2554-2556... (คน)

จำนวนพยาบาลผ่าตัด(Scrub and Circulate nurse)ที่สามารถช่วยในการผ่าตัดข้อเข่าเทียม ....(คน)

จำนวนเตียงในหอพักผู้ป่วยที่สามารถรับผู้ป่วยผ่าตัดข้อเข่าเทียม .... (เตียง)

จำนวนห้องผ่าตัดสำรองในเวลาราชการ .... (ห้อง)

อุปกรณ์ที่ใช้ในการผ่าตัดสามารถยืมจากบริษัทเครื่องมือได้หรือไม่ .....ได้ ....ไม่ได้

ส่วนที่2 แพทย์

จำนวนผู้ป่วยด้านข้อเข่าเทียมที่แพทย์เชี่ยวชาญด้านข้อเข่าเทียมที่สามารถผ่าตัดได้ใน1สัปดาห์.... (คน)

อัตราการเกิดภาวะแทรกซ้อนหลังผ่าตัด (Post-operative complications) ที่มีผลต่อระยะเวลาพักรักษาตัว

ในโรงพยาบาล .... (%)

อัตราการตาย (Mortality rate) ภายหลังการผ่าตัดข้อเข่าเทียม .... (%)

อัตราการรับรักษาตัวในโรงพยาบาลซ้ำ(re-admission) จากภาวะแทรกซ้อนหลังการผ่าตัดข้อเข่าเทียม

.... (%)

ค่าใช้จ่ายทั้งหมดสำหรับการผ่าตัดในโรงพยาบาลเอกชน .... (บาท)

ส่วนที่ 3 ผู้ป่วย

ชื่อผู้ป่วย .... HN: ....

เพศ ..... ชาย .... หญิง อายุ .... (ปี)

ชื่อญาติ .... เบอร์ติดต่อ ....

สิทธิการรักษาของผู้ป่วย...... บัตรประกันสุขภาพถ้วนหน้า .....ประกันสังคม .... เบิกราชการ

โรคประจำตัวของผู้ป่วย ......ไม่มี มี ระบุ ....ควบคุมได้ .....ควบคุมไม่ได้

ระยะเวลาที่ผู้ป่วยถูกวินิจฉัยว่าเป็นภาวะข้อเข่าเสื่อม .... (ปี)

ระยะเวลาที่ผู้ป่วยรอการผ่าตัด นับจากวันที่แพทย์ตัดสินใจผ่าตัดถึงวันที่ถูกรับรักษาตัวในโรงพยาบาล

.... (วัน)

จำนวนสมาชิกในครอบครัว .... (คน)

ระดับการศึกษาสูงสุดของผู้ป่วย .... และสมาชิกในครอบครัว ....

ระหว่างที่รอการผ่าตัดผู้ใดเป็นผู้ดูแลผู้ป่วย

○ ตัวผู้ป่วยเอง

○ บุคคลในครอบครัวของผู้ป่วย

- ก่อนที่จะดูแลผู้ป่วย บุคคลท่านนั้นมีงานประจำหรือรายได้ทางอื่นหรือไม่ เท่าไร

.... ไม่มี   ..... มี เท่าไร .... (บาท)

- ระหว่างที่ดูแลผู้ป่วย บุคคลท่านนั้นยังคงมีรายได้เท่าเดิมหรือไม่ แตกต่าง เท่าไร

.... เท่าเดิม   ..... ลดลง เท่าไร .... (บาท)

○ ผู้ดูแลผู้ป่วย

- อัตราค่าจ้างผู้ดูแลเท่าไรต่อสัปดาห์   ....(บาทต่อสัปดาห์)

รายได้เฉลี่ยของสมาชิกในครอบครัว .... (บาท)

ค่าใช้จ่ายหรือรายได้ที่ลดลงมีผลต่อรายได้โดยรวมของครอบครัวหรือไม่   .....มี   .... ไม่มี

ค่าใช้จ่ายที่ร่วมจ่ายมีหรือไม่ เท่าไร .....ไม่มี   ..... มี เท่าไร .... (บาท)

ระยะเวลารอที่ควรจะเป็น(คาดหวัง) สำหรับการผ่าตัดข้อเข่าเทียมควรเป็นเท่าไร .... (วัน)

VITA

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