COST EFFECTIVENESS ANALYSIS OF TOTAL LAPAROSCOPIC HYSTERECTOMY COMPARE WITH TOTAL ABDOMINAL HYSTERECTOMY IN UTERINE MYOMAS AT RAJAVITHI HOSPITAL

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การวิเคราะห์ต้นทุนประสิทธิผลของการผ่าตัดมดลูกผ่านกล้องเปรียบเทียบกับการผ่าตัดเปิดหน้าท้องในผู้ป่วยเนื้องอกมดลูก โรงพยาบาลราชวิถี

นางสาววิไล ท้วมกลัด

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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Thesis Title	COST EFFECTIVENESS ANALYSIS OF TOTAL LAPAROSCOPIC HYSTERECTOMY COMPARE WITH TOTAL ABDOMINAL HYSTERECTOMY IN UTERINE MYOMAS AT RAJAVITHI HOSPITAL
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วิไล ท้วมกลัด : การวิเคราะห์ต้นทุนประสิทธิผลของการผ่าตัดมดลูกผ่านกล้องเปรียบเทียบกับการผ่าตัดเปิดหน้าท้องในผู้ป่วยเนื้องอกมดลูก โรงพยาบาลราชวิถี (COST EFFECTIVENESS ANALYSIS OF TOTAL LAPAROSCOPIC HYSTERECTOMY COMPARE WITH TOTAL ABDOMINAL HYSTERECTOMY IN UTERINE MYOMAS AT RAJAVITHI HOSPITAL) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศิริเพ็ญ ศุภกาญจนกันติ, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ภิรมย์ กมลรัตนกุล, 74 หน้า.

การศึกษานี้มีวัตถุประสงค์เพื่อคำนวณต้นทุนในมุมมองของผู้ให้บริการ ประเมินประสิทธิผลในระยะสั้น(การไม่มีภาวะแทรกซ้อน) และวิเคราะห์ต้นทุนประสิทธิผลของการผ่าตัดรักษาโรคเนื้องอกมดลูก โดยเปรียบเทียบการผ่าตัดผ่านกล้องและการผ่าตัดแบบเปิดหน้าท้องของผู้ป่วยเนื้องอกมดลูก โดยใช้จำนวนผู้ป่วยผ่าตัดผ่านกล้อง 93 ราย และจำนวนผู้ป่วยผ่าตัดเปิดหน้าท้อง 231 ราย ณ โรงพยาบาลราชวิถี สังกัดกรมการแพทย์กระทรวงสาธารณสุข ระหว่างปี พ.ศ. 2556 – 2558 โดยใช้รูปแบบการวิจัยเชิงพรรณนา เก็บข้อมูลย้อนหลังจากเวชระเบียน และการบันทึกต้นทุนทางบัญชีของโรงพยาบาล

ผลการศึกษาพบว่า ต้นทุนการผ่าตัดผ่านกล้องเท่ากับรายละ 35,019.47 บาท และจำนวนผู้ป่วยที่ไม่มีภาวะแทรกซ้อน 85 ราย คิดเป็น 92.47 รายและต้นทุนเฉลี่ยของผู้ป่วย ที่ไม่มีภาวะแทรกซ้อนเท่ากับ 45,081.10 บาท ในขณะที่ต้นทุนของการผ่าตัดเปิดหน้าท้องเท่ากับรายละ 34,739.5 บาท จำนวนผู้ป่วยที่ไม่มีภาวะแทรกซ้อน 178 ราย คิดเป็น77.06และต้นทุนเฉลี่ยของผู้ป่วยที่ไม่มีภาวะแทรกซ้อนเท่ากับ 54,587.52 บาท

โดยสรุปในมุมมองของผู้ให้บริการในเรื่องต้นทุนและประสิทธิผลในการผ่าตัดมดลูกในผู้ป่วยเนื้องอกมดลูก จากจำนวนตัวอย่าง 324 ราย พบว่าการผ่าตัดมดลุกผ่านกล้องดูเหมือนมีประสิทธิผลมากกว่า การผ่าตัดมดลูกแบบเปิดหน้าท้อง อย่างไรก็ตามจะต้องระมัดระวังในการใช้ผลการศึกษานี้ เท่านั้น เพื่อเป็นข้อมูลในการประกอบการตัดสินใจเลือกวิธีการผ่าตัดเพื่อการรักษาโรคนี้ต่อไป เนื่องจากเป็นการศึกษาของโรงพยาบาลเพียง 1 แห่งและมีข้อจำกัดด้านข้อมูลและวิเคราะห์ผลการรักษาระยะสั้น

สาขาวิชา เศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ ลายมือชื่อนิสิต .....

ปีการศึกษา 2558 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

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WILAI THUAMKLAD: COST EFFECTIVENESS ANALYSIS OF TOTAL LAPAROSCOPIC HYSTERECTOMY COMPARE WITH TOTAL ABDOMINAL HYSTERECTOMY IN UTERINE MYOMAS AT RAJAVITHI HOSPITAL. ADVISOR: ASSOC. PROF. SIRIPEN SUPAKANKUNTI, Ph.D., CO-ADVISOR: PROF. PIROM KAMOLRATANAKUL, M.D., 74 pp.

The purpose of this study is to calculate the treatment cost on the perceptive of provider, to access short outcome of the patients with no complication as well as the cost-effectiveness of the surgical treatments for uterine myomas. This study aims to compare the 93 patients of total laparoscopic hysterectomy with 231 patients of total abdominal hysterectomy in Rajavithi Hospital during 2013-2015. The data source was from the medical records and hospital accounting bills.

This result showed that the total direct cost per unit of total laparoscopic hysterectomy is 35,019.47 THB, the number no complication patients were 85 case (92.47 %) patients. Therefore, the average cost of the operation that patients have no complication is 45,081.10 THB. Moreover the cost of total direct of Total abdominal hysterectomy is 34,739.5 THB, the number no complication patients were 178 cases. Hence, the average cost of the operation that patients have no complications 54,587.52 THB.

The conclusion, from the provider perspective and based on the limited available database, the effectiveness of total laparoscopic hysterectomy seems to be more effective than the total abdominal hysterectomy. However, the interpretation of the study results should be with caution regarding the implementation of a surgical procedure to treat this disease further since this study employed only one hospital data base and compare only short-term outcome.

Field of Study:	Health Economics and Health Care Management	Student's Signature	.....
		Advisor's Signature	.....
Academic Year:	2015	Co-Advisor's Signature	.....

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LIST OF ABBREVLATIONS

ABBREVLATIONS	FULL NAME
CEA	Cost Effectiveness Analysis
TLH	Total laparoscopic hysterectomy
TAH	Total abdominal hysterectomy
EBL	Estimates blood loss
OPD	Out-patient department
IPD	In-patient department
OR	Operation room
GYN	Gynecological
OB-GYN	Obstetrics and Gynecology
GA	General Anesthesia

CHAPTER I
INTRODUCTION

1.1 Problem and Its Significance

Uterine myomas are benign tumors of uterine muscle. The symptoms are depending on their size, location such as those causing menstrual abnormalities, prolonged uterine bleeding, iron deficiency, anemia, pain, infertility, pelvic pressure, and stress urinary incontinence with resultant requests for a definitive treatment. The prevalence of uterine myomas is up to 70% in reproductive-aged women. It consumed a significant portion of the health care resources with total direct cost $2,151,484,847 in US (Claerhout & Deprest, 2005; Flynn, Jamison, Datta, & Myers, 2006).

The management of myomas has become multidisciplinary in the past 20 years. Basically, the choice of treatment depends on the patient's age, the reason for treatment, the issue of fertility preservation, and the patient's preference. The treatment spectrum includes an expectant management, medical therapy, uterine artery embolization, and surgical intervention (Cheng, Chao, & Wang, 2008) . The clinical practice guideline was assessment medical treatments, conservative treatments, selective uterine artery occlusion, and surgical alternatives including myomectomy and hysterectomy.

The selected treatment should be directed towards an improvement in symptomatology and quality of life. The risk-to-benefit ratio must be examined individually by the woman and her health care provider (Hoffman, Schorge, Schaffer, Halvorso, Bradshaw, & Cunnighm, 2012). The women who present with acute uterine bleeding associated with uterine myomas, conservative management first. If the treatment is not successful the physician will provide the surgery for the

necessary woman. If the patients preserve fertility of the uterus, myomectomy is the first considering for their surgeries.

Hysterectomy is a procedure in which the uterus is removed surgically and the one of most commonly perform major gynecological procedures. There are different approaches to performed these procedure which include, abdominal hysterectomy, vaginal hysterectomy, laparoscopic hysterectomy, laparoscopic assisted vaginal hysterectomy or robotic approach. The factors of selection are many factors. For example, physical properties of the uterus and pelvis surgical indication, presence or absence of adnexal pathology, surgical risks, cost, hospitalization and recovery length, hospital resources, surgeon expertise, and anticipated postoperative quality of life are all weighed once hysterectomy is planned (Hoffman et al., 2012).

Hysterectomy continues to be more costly, in both monetary terms (billions of dollars are spent annually) and the more fundamental terms of morbidity and mortality, than the less invasive alternatives. Laparoscopy is becoming the standard of surgical care for gynecologic patients. The first laparoscopic hysterectomy was reported by Reich et al and Caprio in 1989 and since then the procedure has been widely reported (Drahonovsky, Pan M., Baresova, & Feyereist, 2006; Istre, 2008; Shore, 2014). Laparoscopic procedures use optically guided instruments inserted into the body for diagnosis and treatment through temporary ports in the abdominal wall. The advent of laparoscopic approaches to hysterectomy offers the prospect of improved outcomes and gains in cost effectiveness through reduced severity of convalescence and shorter length of inpatient stay, despite apparent benefits, have not been accepted widely because of concerns over costs and safety (Drahonovsky et al., 2006).

Most studies that have looked at costs have studied only the direct costs of the procedures on the basis of hospital charges. The charges for laparoscopic hysterectomy usually were found to be slightly higher than traditional abdominal hysterectomies because of longer operating room

times and increased equipment costs, despite savings on the decreased length of stay (Lenihan, Kovanda, & Cammarano, 2004).

In Thailand, the prevalence of uterine myomas is up from 20-50 % of female (The Thai radiologist Technologist and nurse club in vascular and interventional Radiology, 2013). Hysterectomy is a choice of treatment for the woman who does not preserve fertility of the uterus, and has a criterion to gynecological condition. In 2015, Rajavithi Hospital found 301 cases (6.52%) of the disease in Out-Patients Department. It was a top-third of gynecologic conditions also. Furthermore 270 cases form 301 cases of uterine myomas admitted in In-patients Department for the surgery treatments and the number of total abdominal hysterectomy and total laparoscopic hysterectomy were increasing from 2013, 2014 and 2015 by 76:32 77:24 and 79:37 cases.

So the study of cost effective in 2 surgical treatments between total laparoscopic hysterectomy and total abdominal hysterectomy was interesting. Therefore, it will be benefit for the hospital who provides the surgeries and manages the resources and set up the prices of surgeries. And also it is benefit to the patients, who desire for hysterectomy and their willing ness to pay for the good outcomes for their life, if the insurance don't cover for laparoscopic surgery.

1.2 Research Questions

1.2.1 Primary question

Which operation treatment in uterine myomas is more cost effective between total laparoscopic hysterectomy and total abdominal hysterectomy at Rajavithi Hospital?

1.2.1 Secondary questions

1. What are the costs component of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital?
2. What are the total direct costs and unit costs of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital?
3. What is the effectiveness in term of total number of successful operations in total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital?
4. What is the cost effectiveness of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital?

1.3 Research Objectives:

1.3.1 General Objective

To compare cost, effectiveness and the cost effectiveness of total laparoscopic hysterectomy with total abdominal hysterectomy in uterine myomas at Rajavithi Hospital.

1.3.2 Specific Objectives

1. To determine the cost component of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital.
2. To estimate the total direct cost and unit cost of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital.
3. To determine the effectiveness in terms of total number of successful operations in total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital.

4. To analyse the cost effectiveness of total laparoscopic hysterectomy and total abdominal hysterectomy in uterine myomas at Rajavithi Hospital.

1.4 Hypotheses

Total laparoscopic hysterectomy is more cost effective compared with total abdominal hysterectomy in uterine myomas at Rajavithi Hospital in terms of no complications in short-term outcome and low Cost-Effectiveness Ratio.

1.5 Scope of the Study

Data was collected in patients with uterine myomas at the Gynecology department of Rajavithi Hospital from 1 October 2013 – 31 September 2015. These women should fulfill the criteria for total laparoscopic hysterectomy and total abdominal hysterectomy. List of assumptions are shown as follow.

1. Laparoscopic surgery requires skills that are not common place, and there are limitations on the size and number of fibroids that can be treated by this modality, Rajavithi hospital allowed only fellowship and staff to do the laparoscopic surgery.

2. During the learning curve period the number of surgeons in 1 laparoscopic surgery was higher than open surgeries and long in operation time. The outcomes may depend on the number of cases in these surgeries.

3. The limit of health insurance and different reimbursements in each scheme for the laparoscopic surgery. The government provides total payment only in the civil servant service scheme, for universal coverage and social benefit schemes. It is a co-payment. The patients will pay for the equipment from their pocket. This was limited for surgeons and patients to make the decision for the surgeries. Even the hospital support the budget for the free of charge in projects

of laparoscopic in universal coverage and social benefit schemes during the time of learning curves, but it was the chance for patients in short term.

4. This study is a retrospective study. Measuring the cost-effectiveness in this study is based on available data in medical record and measuring the effectiveness in only short term after they had done the operation until follow up in 6 weeks.

1.6 Possible Benefits

A challenge for all future healthcare providers will be simultaneously managing the increasing costs of healthcare delivery and limited resources available for healthcare consumers. The aging baby-boomer population and constraints of managed care plans will also challenge to provide the highest quality medical care in a timely manner under increasing economic pressures. The findings of cost–effectiveness analyses (CEAs) can help healthcare providers develop strategies to optimize patient care. CEA studies can potentially influence clinical decision making to the extent that healthcare providers practice in a more economically efficient manner and improve the potentially performance of health systems. This process helps ensure that resources devoted to health systems are achieving the maximum possible benefit in terms of outcomes that people value (Raymond, Rob, Tessa, & E., 2003; Tumeh, Moore, Shapiro, & Flowers, 2005).

This study analyzed the cost –effectiveness on the provider perspective in terms of total direct costs and short term of effectiveness between 2 surgery treatments. This study benefits for policy implementation who plan for long term effectiveness in surgery treatments for uterine myomas at Rajavithi Hospital regarding to the excellent center of laparoscopic surgeries,which will provide practice in a more economically efficient in laparoscopic surgery treatments in the future.

CHAPTER II
BACKGROUND

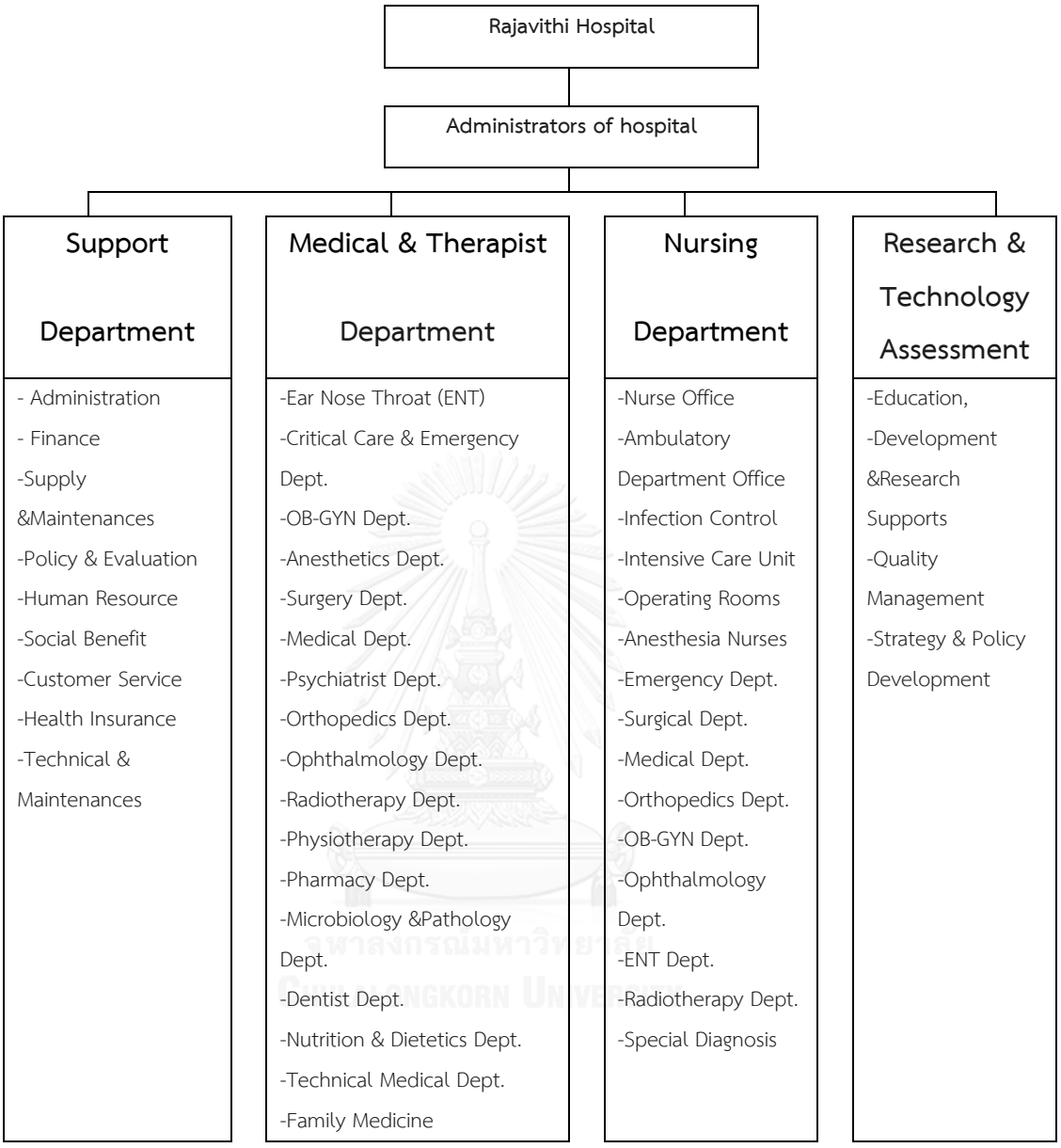
2.1 Rajavithi Hospital

Rajavithi Hospital has emerged itself into one of the largest hospitals under the Ministry of Public Health management and ownership. It is a 1,200 beds, in which the medical center is accommodating 40,000 in-patients and 1,000,000 out-patients yearly or a daily average of 4,000 patients, with 200,000 referral patients (both in and out patients). The hospital provides medical service at standard health promotion in tertiary levels and above, including quality referral system. We have more than 200 medical doctors, over 800 professional nurses and specialized staff and over 4,000 other supporting staff who are ready to provide medical services in varied specialties and healthcare dimensions.

Originally, we were serving only women patients. After that the services had grown into a full spectrum medical service institute for all kind of patients and well-equipped and technology in high international standard and competent medical specialty teams. Six renowned Centers of Excellence offer special treatments and skilled nursing care is ready to serve the wider world through recognized world class standard. This will eventually lead to our transformation a full status international hospital underpinning our population growth as well as exchanging and working together with foreign countries under the umbrella of ASEAN membership.

The organization structure of Rajavithi Hospital shows in the figure2.1.total number of health care staffs was 3766 in 4 departments: 421 staffs in support team department,

Figure2. 1Organization structure of Rajavithi Hospital



978 staffs in medical and therapist department , 2195 staffs of nursing department and 172 staffs in field research & technology assessment.

Rajavithi hospital has strategically developed its advanced medical specialty capacity using expertise in each treatment to further study, apply analytical research, evaluate, develop and transfer know-how to provincial hospitals throughout the country by establishing an information infrastructure blended with an effective referrals system of hospitals under the Ministry of Public

Health nationwide. The hospital is authorized for international referrals covering a spectrum of medical specialties serving patients sent from other countries. Our Centers of Excellence have been in professional service over three decades in Ear Nose and Throat (ENT), Trauma, Head and Neck Cancer, Organ Transplantation, Cardiovascular Disease and the Retina. Laparoscopic and Endoscopic Surgery is one of Centers of Excellence in general surgery, orthopedic, ENT, cosmetic, heart and chest, Neurological, Obstetrics and Gynecology Surgery. Additionally, it is still a training center for residents and fellow for laparoscopic surgery. The rate of laparoscopic Gynecology Surgery increasing 101 to189 cases in 2013 -2015.

2.2 Uterine myomas

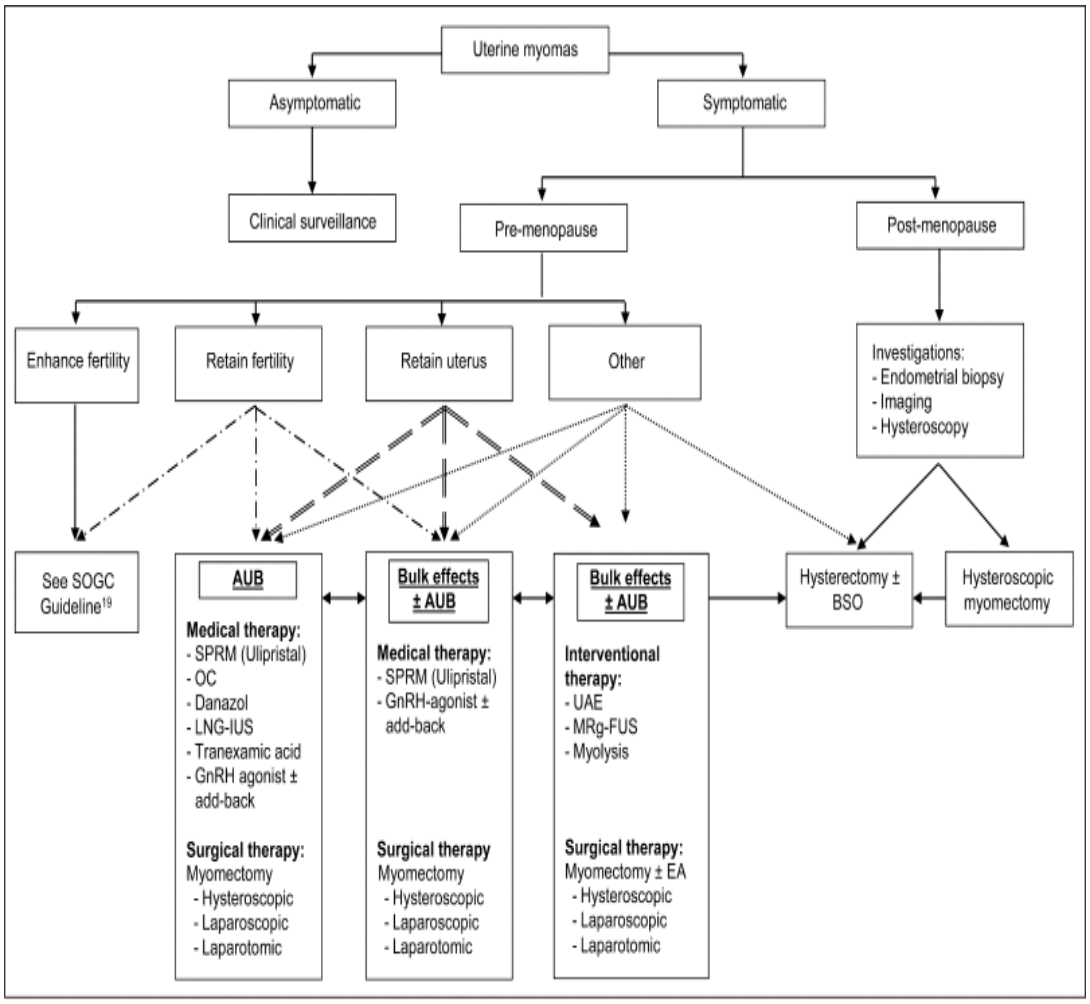
Uterine myomas are benign tumor of uterine muscle. Although they are composed of the same smooth muscle fibers as the uterine wall, they are many times denser than normal myometrium. Myomas can be single or multiple and can vary in size, location, and perfusion. Myomas are commonly classified into 3 subgroups based on their location: subserosal (projecting outside the uterus), intramural (within the myometrium), and submucosal (projecting Into the cavity of the uterus). Uterine myomas can also cause a number of symptoms depending on their size, location within the uterus, and how close they are to adjacent pelvic organs. Large fibroids can cause heavy menstrual flows, bleeding between periods, pain, infertility, pelvic pressure stress and uterinary Incontinence ureteral obstruction (Vilos et al., 2015).

2.3 Treatment rational

The clinical practice guideline was assessment of medical treatments, conservative treatments, selective uterine artery occlusion, and surgical alternatives including myomectomy and

hysterectomy. The selected treatment should be directed towards an improvement in symptomatology and quality of life. The risk-to-benefit ratio must be examined individually by the woman and her health care provider. No single treatment plan is best for all women with uterine myomas. The woman who has asymptomatic symptoms is not necessary to treat. The myomas are measured and observed over time, with the expectation that at menopause, they will regress. However, for those with significant symptoms, very large myomas, or rapidly growing myomas, a number of treatments can be considered. Important factors in deciding therapy are the severity of the symptoms, associated symptoms, age, and preservation of fertility. Figure 2.2 showed details for the management of uterine myomas. ((Doherty, Mutlu, Sinclair, & Taylor, 2014; Vilos et al., 2015).

Figure2. 2 Algorithm for the management of uterine myomas. (Vilos et al., 2015)



BSO: bilateral salpingo-oophorectomy; MRg-FUS: Magnetic resonance-guided focused ultrasound; OC: oral contraceptives

2.4 Operation Method

Treatment of women with uterine myomas must be individualized based on symptomatology, size and location of fibroids, age, need and desire of the patient to preserve fertility or the uterus, the availability of therapy, and the experience of the therapist. The traditional surgical treatments for symptomatic myomas are laparotomy with hysterectomy or myomectomy. Hysteroscopy myomectomy should be considered first-line conservative surgical therapy for the management of symptomatic. Hysterectomy is the only permanent cure for uterine myomas. It

provides definitive treatment, but requires major surgery, abdominal, vaginal or laparoscopic or with robotic assistance (Istre, 2008; Vilos et al., 2015). Hysterectomy for benign indications, irrespective of surgical technique, increases the risk for subsequent urinary stress incontinence surgery. They also found that hysterectomy increased the risk of having subsequent pelvic prolapse surgery at a later stage. And hysterectomy continues to be more costly, in both monetary terms (billions of dollars are spent annually) and the more fundamental terms of morbidity and mortality, than the less invasive alternatives of myomectomy, ablation and myolysis. Myomectomy can be removed surgically via hysteroscopic procedures. Although morbidity is reduced with endoscopic surgery, this technique is not widely available and has limitations. The demand for alternative treatments has increased during the last decade, pushed forward by women resisting hysterectomy and physicians looking for less invasive procedures (Nieboer et al., 2009).

Approaches to hysterectomy may be broadly categorized into four options: abdominal hysterectomy (AH); vaginal hysterectomy (VH); laparoscopic hysterectomy (LH) where at least some of the operation is conducted laparoscopically, and robotic-assisted hysterectomy (RH)(Liu et al., 2014; Nieboer et al., 2009; Rosero, Kho, Joshi, Giesecke, & Schaffer, 2013).

1. Total laparoscopic hysterectomy (TLH) is a laparoscopic hysterectomy in which all of the surgical dissections, ligations, and sutures are completed entirely through the trocars, including the closure of the vagina.
2. Total abdominal hysterectomy (TAH) is the removal of the uterus and cervix through and cervix through an incision made in the lower abdomen. TAH has traditionally been the surgical approach for gynecological condition.

3. Laparoscopic assisted vaginal hysterectomy (LAVH) is the vaginal hysterectomy assisted by laparoscopy; the laparoscopic procedures may include adenexectomy and the superior portions of the hysterectomy, but not ligation of the uterine
4. Vaginal Hysterectomy (VH) is a surgical procedure to remove the uterus through the vagina.
5. Robot-assisted surgery (RAS) is a technological advance in CLS in that the laparoscope and the surgical instruments are part of a mechanical system that the surgeon operates, known as robotic surgery. It is a recent innovation in the field of minimally invasive surgery.

Since there are multiple approaches to hysterectomy, each with their procedure-specific advantages and disadvantages, it is important to know which procedure is superior with respect to patient related outcomes. The introduction of the newer approaches to hysterectomy (TLH and TAH) has stimulated much greater interest in the scientific evaluation of all forms of hysterectomy. However, the more approaches which exist, the more complex it becomes to decide on the best approach for each individual woman and considering the safest and most cost-effective route to fulfill all needs of the patients. (Elessawy et al., 2015; Nieboer et al., 2009; O'Hanlan, Dibble, Garnier, Reuland, & 2007; Rock & Jones, 2008).

CHAPTER III

LITERATURE REVIEW

3.1 Economics evaluation in health care and clinical fields

Economic evaluation is the comparative analysis of alternative courses of action in terms of both their costs and consequences. With increasing health care expenditure and limited resources, it is important for physicians to consider the economic impact of their interventions. It helps efficiently allocating limited health care resources. In other word, it helps improving the value for money from investing in health care and welfare. In essence health EE is about evaluating "choices" to determine the most cost-effective option for allocation. In general, there are two approaches to health economics evaluation : trial-based studies and modeling studies (Rudmik & Drummond, 2013).

We can classify economic evaluation according to the consequence of the programs or sources of data use in the study (M. F. Drummond, Sculper, Torrance, O'Brien, & Stoddard, 2005; L. Rudmik & M. Drummond, 2013)

1. Cost-minimization analysis (CMA) is the economic evaluation refers to the simple comparison of cost between two interventions. This form of analysis should only be used when the consequences between two interventions are assumed to be the same; therefore, the goal is to identify the intervention with the lowest cost.

2. Cost-effective analysis (CEA) is the commonly used type of economic evaluation. The outcomes are measured in natural unit with are vary upon disease or programs of interest. The natural units can include a range of clinical end points such as, life years gained, symptom-free days, complications avoided, or cases diagnosed. The goal of CEA is to maximize societal health benefits while functioning within a constrained budget.

3. Cost- utility analysis (CUA) is a form of economic evaluation that focuses on measuring the patient's preference for being in a particular health-state (a form of quality of life outcome). The preference outcome is called a utility score, and is recorded between 1 [perfect health] and 0 [death] which can easily to compare across programs.

4. Cost benefit analysis (CBA) is considered the most comprehensive method for, economic evaluation and it is grounded in traditional welfare economics theory. In CBA, the consequences of an intervention are valued in monetary terms; therefore, it places money values on both inputs (costs) and outputs (benefits) of health care Since outcomes are reported in monetary units, which is easy to be compared across studies. It is the best method to inform allocation decisions. However, it is difficult to measure health outcome in monetary unit.

3.2 Cost-effectiveness analysis in health care

Cost-effectiveness analysis (CEA) is a type of economic evaluation that examines both the costs and health outcomes of alternative intervention strategies by studies of prospective new interventions compared to current practice. If the health outcome is the same, preventing or treating the disease, then analysts need only compare the costs of different interventions, consequences of alternative interventions using clinical outcomes in "natural units." The natural units can include a range of clinical end points such as, life years gained, symptom-free days, complications avoided, or cases diagnosed. The result of cost effectiveness is cost-effectiveness ratio, expressed as cost per outcome, which can be compared across various types of services or various service locations that perform the same function. The goal of CEA is to maximize societal health benefits while functioning within a constrained budget. It can potentially influence clinical decision making to the extent that healthcare providers practice in a more economically efficient

manner (Fogarty International Center of the U.S. National Institutes of Health The World Bank World Health Organization Population Reference Bureau, 2008; Rudmik & Drummond, 2013).

Table3. 1 Advantages and Disadvantages of CEA (Rudmik & Drummond, 2013)

Advantages	Disadvantages
1. Easier to produce since it uses common study clinical end-points 2. Requires less resources since the health outcome is typically already being measured from the effectiveness component of the study shifting resources 3. Tends to be easier for clinicians to interpret since it uses familiar clinical end-points.	1. Inability to make inter disease comparisons 2. Cannot measure opportunity cost of 3. Challenge to define and justify the most 4. appropriate ‘effectiveness’ end-point

There are several advantages of CEA in table3.1, the major disadvantage is the inability to provide Inter disease comparisons; therefore, it cannot measure the opportunity cost of implementing one intervention over another choice. Due to the inherent scarcity of health care resources, the “opportunity cost” refers to the loss of health benefits that would have been created if the resources were used in another health care sector. The inability to measure opportunity cost creates a challenge for policy makers to make appropriate decisions pertaining to efficient resource allocation.

3.2.1 Incremental Cost Effectiveness Ratio (ICER)

Cost-effectiveness comparisons should compare the incremental costs and effects, meaning the additional cost that one program impose compared to the additional benefit it delivers. This should be expressed as the "Incremental Cost-Effectiveness Ratio" (ICER), which is calculated by dividing the incremental cost of the new intervention by the incremental change in effectiveness. The policy makers want to implement interventions with the lowest ICER (Rudmik & Drummond, 2013; Willan & Briggs, 2006).

Mittapalli, Fanning, Flora & Fenton (2007) compare cost-effectiveness analysis of hysterectomy the treatment of large leiomyomas by laparoscopic assisted vaginal hysterectomy (LAVH) versus abdominal hysterectomy (AH) by used twenty consecutive LAVH were compared to 20 consecutive AH for leiomyoma 250 g. Hospital costs were obtained through Healthcare cost accounting system. They found that median uterine weight (513 g) was 20% for LAVH. Length of stay and pain was significantly less for LAVH. Total hospital cost for AH was 12% less expensive ($4394 vs $5023). Because of multiple benefits of LAVH versus AH and no significant difference in cost, they believe LAVH is an acceptable treatment for large leiomyoma. In previous studied of Sculpher, Manca, Abbott, Fountain, Mason, & Garry (2004) found that cost effectiveness analysis based on two parallel trials: laparoscopic compared with vaginal hysterectomy and laparoscopic compared with abdominal hysterectomy. One year costs estimated from NHS perspective. Health outcomes expressed in terms of QALYs based on women's responses to the EQ-5D. They found that laparoscopic hysterectomy is not cost effective relative to vaginal hysterectomy. Its cost effectiveness relative to the abdominal procedure is finely balanced, same with studied of Crawford (2004) found that laparoscopic hysterectomy does not offer any cost-effectiveness

benefit over vaginal hysterectomy. Laparoscopic hysterectomy was similarly cost effective to abdominal hysterectomy.

3.3 Systematic review

Due to the small size of sample in this study, in order to make the results more precisely, systematics review is the method to increase the reliability results. Systematic review is a review undertaken with systematic process to comprehensively identify relevant studies and synthesize findings summary findings on a given topic. Key steps of a systematic review include comprehensive search strategies, clear specification of inclusion criteria, and standard data extraction with quality assessment. Meta-analysis is a systematic review with quantitative synthesis using statistical techniques to combine the results of previous research (studies). When quantitative data are available in a pool able format, meta-analysis is used to summarize study the overall findings with more precise estimates with 95% confidence Interval (Deeks, Higgins, & Altman, 2008; Elena Kulinskaya, Morgenthaler, & Staudte, 2008; Paul Glasziou, Colditz, Glasziou, & et al., 2001).

The search strategy of the review was to compare the costs and cost effectiveness of TLH versus TAH and sought from a systematic review of the literature. The electronic databases Medline, Embase and the Cochrane library database were searched for relevant articles. Search terms in only English langue used were: costs, laparoscopy, laparotomy, hysterectomy and randomized. All studies that compared costs between AH and all forms of LH were included in this review. Studies were excluded from the review if they made comparisons other than those specified above and randomized controlled trials were included in terms of their methodology and design by using a predetermined protocol and graded as to the level of evidence.

The findings of the outcomes provide for the most important outcomes for someone making a decision. These include potential benefits and harms. A risk ratio (RR) is the probability of

an outcome occurring. A risk ratio is the ratio between the risk in the intervention group and the risk in the control group. If the RR is exactly 1.0, this means that there is no difference between the occurrence of the outcome in the intervention and the control group. If the RR is greater than 1.0, the intervention increases the risk of the outcome. If the RR is less than 1.0, the intervention decreases the risk of the outcome.

The mean difference is the average difference between the intervention group and the control group across studies. A weighted mean difference, which means the results of some of the studies make a greater contribution to the average than others. .This way of measuring effect is used when comparing data for continuous outcomes, a standardized mean difference (SMD) may be provided. This is a weighted mean difference standardized across studies giving the average difference in standard deviations for the measures of that outcome (Aarts et al., 2015)

A confidence interval is a range around an estimate that conveys how precise the estimate is. The confidence interval is a guide to how sure we can be about the quantity we are interested in the true absolute effect. The narrower the range between the two numbers, the more confident and the wider the range, the less sure we can be. 95% Confidence Interval (CI) indicates the extent to which chance may be responsible for the observed numbers. In the simplest terms, a 95% CI means that we can be 95 percent confident that the true size of effect is between the lower and upper confidence limit. Conversely, there is a 5 percent chance that the true effect is outside of this range. The statistically significant means that a result is unlikely to have occurred by chance. The usual threshold for this judgment is that the results, or more extreme results, would occur by chance with a probability of less than 0.05

A systematic review is a review which comprehensively identifies all relevant studies and synthesizes summary finding on a given topic. It is essential tools for health care workers,

researchers, consumers and policy makers who want to keep up with the evidence that is accumulating in their field. Systematic reviews are also important to demonstrate areas where the available evidence is insufficient and where new, adequately sized trials are required. A systematic review is using statistic techniques for quantitative synthesis, which is a meta-analysis to combines the result of previous research. In addition to providing a precise estimate of the overall treatment effect in some instances, appropriate examination of heterogeneity across individual studies can produce useful information with which to guide rational and cost effective treatment decisions (Elena Kulinskaya et al., 2008).

Systematic review and meta-analysis of methods of hysterectomy for benign gynecological disease from (Johnson et al., 2005a) studied from 27 RCTs (total of 3643 participants) were included in study. The interventions had to comprise at least one. Hysterectomy method compared with another; and trials had to report primary outcomes (time taken to return to normal activities, intraoperative visceral injury, and major long term complications) or secondary outcomes (operating time, other immediate complications of surgery, short term complications, and duration of hospital stay). The result found that return to normal activities was quicker after vaginal hysterectomy than after abdominal hysterectomy (weighted mean difference 9.5 (95% CI 6.4 to 12.6) days and after laparoscopic than after abdominal hysterectomy (difference 13.6 (95% CI 11.8 to15.4) days. There were more urinary tract injuries with laparoscopic than with abdominal hysterectomy (odds ratio 2.61 (95% CI 1.22 to 5.60)). Vagina hysterectomy was significantly speedier return to normal activities and other improved secondary outcomes (shorter duration of hospital stay and fewer unspecified infections or febrile episodes). This suggests that vaginal hysterectomy is preferable to abdominal hysterectomy where possible. Where vaginal hysterectomy is not possible, laparoscopic

hysterectomy is preferable to abdominal hysterectomy, although it brings a higher chance of bladder or ureter injury

The review of surgical approach to hysterectomy for benign gynecological disease in Laparoscopic hysterectomy (LH) versus AH from 25 RCTs, (2983 women) (Nieboer et al., 2009) shown that return to normal activities was shorter in the LH group (MD -13.6 days, 95%CI -15.4 to -11.8; six RCTs, 520 women, I2 = 71%, low quality evidence), but there were more urinary tract injuries in the LH group (odds ratio (OR) 2.4, 95% CI 1.2 to 4.8, 13 RCTs, 2140 women, I2 = 0%, low quality evidence). There was no evidence of a difference between the groups for the other primary outcomes. The conclusion was among women undergoing hysterectomy for benign disease, vaginal hysterectomy appears to be superior to laparoscopic and abdominal hysterectomy, as it is associated with a speedier return to normal activities. When technically feasible, vaginal hysterectomy should be performed in preference to abdominal hysterectomy because of more rapid recovery and fewer febrile episodes postoperatively. Where vaginal hysterectomy is not possible, laparoscopic hysterectomy has some advantages over abdominal hysterectomy (including less operative blood loss, more rapid recovery, fewer febrile episodes, and fewer wound or abdominal wall infections) but these are offset by a longer operating time. No advantages of laparoscopic over vaginal hysterectomy could be found; laparoscopic hysterectomy had a longer operation time, and total laparoscopic hysterectomy had more urinary tract injuries. The surgical approach to hysterectomy should be decided by the woman in discussion with her surgeon in light of the relative benefits and hazards. These benefits and hazards seem to be dependent on surgical expertise and this may influence the decision.

Another review of a meta-analysis abdominal hysterectomy versus total laparoscopic hysterectomy for benign disease (Walsh, Walsh, Tang, & Slack, 2009) from 3 RCTs compared

outcomes in total abdominal hysterectomy (TAH) and total laparoscopic hysterectomy (TLH) for benign disease. TLH is associated with reduced overall peri-operative complications (pooled OR 0.19; 95% CI 0.07–0.50) and reduced estimated blood loss (WMD (183 ml; 95% CI 346 ml to 21 ml; p = 0.03). Additionally, there are trends towards shorter hospital stay (WMD (2.5 days; 95% CI 5.1 days to 0.01 days; p = 0.05) and post-operative haematoma formation (pooled OR 0.17; 95% CI 0.03–1.01) compared to TAH. The only trade-off appears to be a longer operating time in the TLH group (WMD 22 min; 95% CI 5–39 min; p = 0.01). Rates of major complication were not statistically different (pooled OR 1.35; 95% CI 0.32–5.73) though this analysis is likely underpowered to detect many major complications. As such, TLH appears to offer benefits to women requiring total hysterectomy for benign indications compared to TAH, particularly regarding minor complications, blood loss and hospital stay.

3.4 Total laparoscopic hysterectomy and total abdominal hysterectomy analysis

Total laparoscopic hysterectomy is to provide a treatment option with smaller incisions and scars, shorter hospital stay and shorter recovery period than for open surgery. Several small incisions provide access for the laparoscope and surgical instruments. The abdomen is insufflated with carbon dioxide (Perino, Cucinella, Venezia, Castelli, & Cittadini, 1999).

The patient was placed in the lithotomy position with her legs open at 60°, under general anesthesia. Foley urinary catheter insert the bladder was emptied during the operation. After a CO2 pneumoperitoneum was created, a 10 mm trocar was placed in the umbilical site to introduce the laparoscope and the camera. Three ancillary 5 mm trocars were also placed suprapubically. After an accurate abdominal pelvic inspection, lysis of any adhesions was performed. The uterus was mobilized, making the various anatomical planes more accessible. After bipolar coagulation, the

round ligament was sectioned at ~3 cm from the uterus. The areolar tissue of the broad ligament was dissected and its posterior folds fenestrated at an avascular area above the uterine vessels (Figure 3.1). This maneuver permitted a better mobilization and identification of the infundibulo-pelvic ligament, whose vessels were coagulated and cut using bipolar forceps and scissors under direct visualization of the pelvic ureter. Once the uterine ligaments were sectioned, the operation continued centrally in a downward direction. After, the vesico–uterine peritoneal fold was opened by scissors and a bladder dissection from the low uterine segment down to the upper part of the vagina was performed; during this step, the location of the right cleavage plane was crucial to avoid any bladder injury. The utero-sacral ligaments were then coagulated and sectioned, thus favoring lateralization of the ureter from the uterus. At this point, the uterine artery was carefully skeletonized and, by exerting the right pressure on the uterine manipulator, it became more evident at the level of the ascendant branches and was then coagulated with bipolar forceps and cut with scissors.

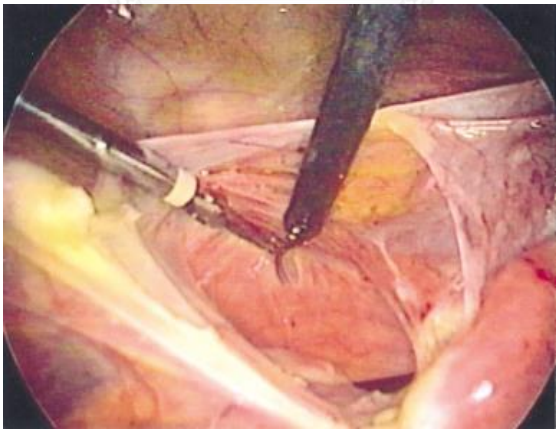


Figure3. 1 The posterior fold of the broad ligament has been opened at an avascular area above the uterine vessels, so making easier the mobilization and dissection of the infundibulo-pelvic ligament (Perino et al., 1999)t.

The operation continued with the coagulation and incision of the cardinal ligaments in order to expose the vaginal fornices, separated from the stump of the uterine artery. Circular colpotomy was then performed and the uterus was removed by wedge morcellation was also performed. Finally, the vaginal vault was sutured laparoscopically or vaginally (only in one case), and the pelvis was then checked in order to ensure haemostasis and to perform pelvic irrigation, thus removing blood clots. Intra-operative cystoscopic examinations were performed to rule out bladder injuries in only four procedures in which an extensive bipolar electrosurgery was utilized owing to brisk bleeding during bladder dissection.

Abdominal hysterectomy was performed according to the technique described for benign disease (Mattingly and Thompson, 1985). The beginning of the operation was calculated the moment of cutaneous incision for the abdominal technique. Cutaneous suture was considered the end of the operation in both cases.

Total laparoscopic hysterectomy compare with total abdominal hysterectomy was shorter hospital stay, speedier return to normal activities, and fewer abdominal wall infections or febrile episodes, associated with less blood loss, but it takes longer and urinary tract injuries are more likely (Johnson et al., 2005a). The rates of intraoperative were no significant in both operations.

3.5 Cost

Costs are the values of all the resource of tangible or intangible, used to produce a good or a service. Estimating the costs of health interventions is important to policy-makers for a number of reasons including the fact that the results can be used as a component in the assessment and improvement of their health system performance. WHO has been developing a database on the

overall costs of health interventions Costs can be divided into patient costs and non-patient or programe cost. Patient costs refer to all costs at the point of delivery such as outpatient visits, bed days, drugs, or laboratory tests. Programme costs include costs incurred at the administrative levels of the district, provincial or central-levels, i.e. the costs incurred at a level other than the delivery point of an intervention to beneficiaries. The components include such items as administration, training or media campaigns("World Health Organization," 2003).

Cost is the key parameter of evaluation and the perspectives of the study is important issue because it affect the process of resources use identification for cost calculation. The commonly use study perspectives are societal perspective, provider perspective, payer perspective and patient perspective (Johns, Baltussen, & Hutubessy, 2003). Economists think of costs as consequences of choices. In the real world, resources are scarce. Because resources are limited, all necessary interventions cannot be implemented. When decision makers choose to implement a program, the resources expended will not be available for other possible uses ("Centers for Disease Control Prevention U.S. Department of Health," 2013)

Because costing take substantial time and effort, it is important for researcher to know the precision of costing in the study. There are several levels of precision in hospital costing from most precise as follows, micro-costing, case-mix , disease-specific per diem, average per diem and cost to charge ratio. Total health provider cost was calculated from labor costs, material costs and capital cost. In this study estimates from out-patient department, operation room, in-patient room, in case of the patients of the Gynecology department,

3.5.1 Step of cost calculation

1. Cost center identification & grouping

Organizational structure was analyzed and classified as cost centers. All cost centers were classified into two groups: transient cost centers and absorbing cost centers

1.1 Non-Revenue Producing Cost center: NRPCC

Non-Revenue Producing Cost center (NRPCC) are cost centers that does not charge directly for their service. They provide support services to both other non-revenue producing cost center and revenue producing cost center.

1.2 Revenue Producing Cost Center: RPCC

Revenue Producing Cost Center (RPCC) are cost center that are not only to provide service responsible but also generate revenue by those service to the hospital such as radiology, laboratory and physiotherapy etc.

1.3 Patient Service (PS)

Patient Service (PS) is the cost centers that are responsible directly for patient service.

2. Direct cost and Indirect cost determination:

Direct costs of each cost Centre were determined by summation of its capital costs, labor costs and material costs. (M. Drummond, O'Brien, Stoddart, & Torrance, 1997; Riewpaiboon, Malaroje, & Kongsawatt, 2007).

Labor Cost (LC) is all types of personal such as: doctor, nurse, health and workers. refers to the summation of salaries, wages, incentives and fringe benefits such as accommodation, training expenses, and healthcare expenses Then labor cost was assigned to cost centers based proportion of time spent for each cost centre. The dimension determining cost is by time worked.

Material cost (MC) is resources that use less than one year and unit cost is lower than 5,000THB. Material costs cover drug and medical material (e.g. scientific materials and medical supplies), office materials, household materials, petrol and utilities (electricity, water, telephone

and mail). Maintenance costs of equipment, vehicles and buildings are classified as material cost because they recur. The dimension determining cost by weight per volume in supply and time used or space used in operation & maintenance. The specific methods employed for base case analysis were as follows:

Capital cost (CC) is resources that last longer than a year or price is higher than 5,000 THB. The economic-based approach of capital costing covers both depreciation cost and opportunity cost (interest) of making the investment in land and building. Dimension determining cost are by time used or space used. Capital cost consists of two components: costs of capital items, and opportunity costs of land and stocked materials in equipment (Riewpaiboon et al., 2007). The calculation is to divide current price by annuity factor. Current price is the result of adjusting purchase price by consumer price index. The annuity factor is calculated based on useful life and discount rate (Drummond et al. 1997). The discount rate, as recommended by WHO guide was 3% (WHO, 2003).

3. Allocation Criteria

Proposed allocation criteria vs. base case allocation criteria of indirect cost allocation: for the Clerical Works supporting cost centre, number of documents was used as allocation criteria instead of weighted criteria of number of document and person-year equivalent. Number of person-months involved in payroll operations was used instead of weighted criteria of payroll (Riewpaiboon et al., 2007).

4. Full cost determination

This step is the identification of the full costs of inputs. Inputs are labor costs, material costs, and capital costs.

The formula of full cost as

Full cost = Labor cost + Material cost + Capital cost

5. Unit cost calculation

The unit cost will be calculated by dividing the total cost by output.

$$\text{Unit} = \frac{\text{Full cost}}{\text{Out put}}$$

3.6 Effectiveness

The effectiveness of a hysterectomy should be assessed in terms of health outcomes assessed such as reduced anxiety, increase or decrease of physical and/or sexual functioning, relief of pain, days lost from work, length of stay in hospital, cost, survival data quality of life, successful pregnancies, blood transfusion requirements, hemoglobin levels successful pregnancies, length of hospital stay, and operating time (Gurusamy, Vaughan, Fraser, Best, & Richards, 2016; Vilos et al., 2015). However, this study focused on the provider perspective, so the outcomes in term of the patient perspective did not include in this study.

Total laparoscopic hysterectomy (TLH) is an alternative to laparotomy, this procedure provides good outcome, although it takes longer operative time, more blood loss and higher cost. The several benefits offered over TAH such as smaller incision, less postoperative pain, earlier ambulation, shorter hospital stay, faster recovery time and post-operative wound infection or more serious complications does not increase. Its cost effectiveness of TLH relative to the TAH procedure is finely balanced. TLH is the alternative and effective choice in the management of benign gynecologic disease by a well-trained gynecologist and team (Ikram, Saeed, & Jabeen, 1012; Olsson, M., & M., 1996; Sutasanasuang, 2011). In systematic review of controlled trials found that the shorter hospital stay in the LH group compensates for the increased procedure costs, with less morbidity (Bijen et al., 2009).

TLH can be performed more safely and under vision, with less blood loss, early post-operative recovery, less post-operative infection, and less complication rate. 858 laparoscopic hysterectomies, 850 were done for benign indications, and 8 done for malignancies included and the surgeries were performed by the same surgeon, using the same surgical technique. The medical records were reviewed, and data were collected with respect to age, indications, type of surgery performed, intraoperative variants, and post-operative complications. The result shows that patient average age was 44.9 ± 6.2 years. Most common indication for benign TLH was leiomyoma of 54.4 %. The maximum uterine size operated on was from 20–26 weeks, 4.9 % (n = 42). The minimum and maximum operating time during the total study period was 20 min–2 h. The major complication rates were 0.9 % (n = 8). The hospital stay was not more than 2 days (Bettaiah & Reddy, 2016).

3.7 Uncertainty and Sensitivity analysis

The most common method of handling data uncertainty is sensitivity analysis (SA) whereby the results of the EE are studied after changing key variables for both cost and effectiveness. Parameter uncertainty is the common kind of uncertainty which may affect the results. Sensitivity analysis is to determine the influence of the uncertainty. Check the robustness of the results. Requiring SA means that the measurements made of the input parameters are imprecise or applies to probabilities, costs, utilities, treatment effects (RR, OR). Generally, the input parameters used in main analysis are “MEAN” value after changing key variables for both

cost and effectiveness (M. F. Drummond et al., 2005; Rudmik & Drummond, 2013).

There are several forms of SA for EE, and a full review of this topic is beyond the scope of this article. A strong SA is imperative to providing policymakers with the necessary information to make informed decisions. The method of SA: (Rudmik & Drummond, 2013)

1. Simple SA (i.e., one-way SA) is performed by varying single parameter estimates, one at a time, in order to estimate the overall effect on the CEA results. Multiple simple SAs can be combined into one graph and represented as a "Tornado diagram," which provides a graphical view of the effect of varying several individual parameters.

2. Probabilistic SA is considered the most robust and comprehensive method of handling uncertainty in EE. In this method, specific ranges of probabilities are applied to the specific parameter ranges, and a computer-generated random sample of potential outcomes is produced. This will generate an empirical distribution of cost-effectiveness.

3.8 Discounting

During economic evaluations, future costs are commonly discounted because of the impact of time preference. Time preference refers to the advantage of accruing costs in the future rather than today. A positive rate of time preference for costs exists primarily due to the consistent demonstration of positive economic growth over time. Therefore, during economic evaluations, all future costs need to be discounted to accurately reflect the lower cost compared to costs incurred today(Rudmik & Drummond, 2013). For country-specific analysis, the local rate of return on long-term government bonds would ideally be used as the social discount rate for costs. Despite significant controversy, current practice tends to discount both costs and effects at the same rate. The National Institute for Clinical Excellence ("National Institute of Clinical Excellence: Guide to the methods of technology.," 2008) recommends that costs and effects be discounted at 3.5%, while the World Health Organization recommends that costs and effects be discounted at 3% for the base case, with a sensitivity analysis using 0% for effects and 6% for costs (Murray, Evans, Achary, & Baltussen, 2000).

3.9 Decision analytic modeling

Decision modeling focuses on evaluating a specific clinical decision or pathway. It incorporates data from several sources and enters it into a framework that can assist policy makers by identifying the most cost-effective option. Since economic models intentionally simplify a complex clinical scenario, critical components that must be addressed identifying appropriate comparators, including all relevant clinical data to define accurate probabilities and expected effectiveness values, define how intermediate clinical end points can be extrapolated into long-term outcomes, ensuring results can be applicable to the decision-making context. The common methods of decision modeling are decision tree modeling and Markov modeling (Rudmik & Drummond, 2013)

1. Decision Tree Analysis

Decision tree analysis involves identifying the expected costs and effects of following a patient through clinical pathways resulting from a clinical decision. The “decision node” in the decision tree pertains to the square box at the start of the tree and represents the decision being evaluated in the model. The “chance node” pertains to the range of possible clinical pathways that can result from making the intervention decision. Each branch from the chance node in decision tree modeling has a probability assigned based on the chance that a patient travels down that specific route. At the end of the decision tree, each pathway has a combined probability, cost, and expected effect. These values from the beginning to the end of tree provide an overall cost effectiveness ratio for each decision in the model. The limitation of decision tree analysis is that it assumes the event occurs within a single discrete time point.

2. Markov Modeling

Markov modeling is a method for determining cost-effectiveness is based on cycling patients through “health states” rather than traveling down clinical branches. Patients cycle through predefined health states relevant to the disease being evaluated and accumulate costs and effects based on which state in their occupy. Therefore, the completion of each cycle, there is a cost and effect for each health state. At the completion of all cycles, the total cost-effectiveness ratio for the intervention is calculated by summing up all the weighted costs and effects for each individual cycle. Markov model is evaluating decisions that result in economic outcomes over a long period of time.

In this study used the decision tree analysis involves identifying the expected costs and effects of the following a uterine myomas patients through clinical pathways of TLH or TAH from a clinical decision mode. At the chance node is a result from making the decision for TLH or TAH. Each branch from the chance node in decision tree modeling has a probability assigned based on the chance that occur after the patient has done TLH or TAH.

CHAPTER IV

RESEARCH DESIGN & RESEARCH METHODOLOGY

4.1 Study design

This study compared the total laparoscropic hysterectomy and total abdominal hysterectomy in uterine myomas using economic evaluation method which is cost effectiveness analysis. This study is a retrospective descriptive study conducts to estimate the cost and calculate the cost effectiveness of two operation interventions in uterine myomas from primary and secondary data during October 1st , 2013 – September 30th, 2015.

In order to analyze the different of patients status after their treatment, this study categorize between intraoperative and postoperative complications, including short-term effectiveness in 6 weeks according to decision tree and do system review to find the comparable studies, perform the sensitivity analysis.

4.2 Population & Sample

4.2.1 Target Population

This study uses a retrospective secondary data collection. Target population was the uterine myomas patients who were no underlying chronic disease and operated by total abdominal hysterectomy and total abdominal hysterectomy according to the eligible criteria.

4.2.2 Eligibility Criteria

Inclusion criteria

1. Patients with uterine myomas had surgery by total laparoscopic hysterectomy and total abdominal hysterectomy.
2. Age 21 – 50 years old.
3. Myomas sizes is lower than 280 grams or 12 weeks of gestation.
4. No underlying cardiac or pulmonary disease
5. No contra indication of laparoscopic surgery.
6. Hematocrit more than 30% for pre operation

Exclusion criteria

1. Uterine size > 400 gms.
2. Recent anti-inflammatory.
3. Coagulation disorders
4. Co-surgery needed

According to the operation treatments, uterine myomas patients are divided into 2 groups. After selecting sample from target population, and study the post-operative follow up 6 week after they leave hospital in good condition, or without complications that was a success operation treatments. If they had any complication dealing the operation time, hospitalization or 6 weeks after they left the hospital that were not success operation treatments.

4.2.3 Sample selection

There were 324 target populations of uterine myomas which were treated by total hysterectomy using 2 different surgeries between total abdominal and laparoscopic hysterectomy according to the eligible criteria, the total laparoscopic hysterectomy patients are 93 and the

total abdominal hysterectomy patients are 231. The groups were similar with respect to age, gravidity, body mass index and mean uterine weight.

4.3 Data collection

4.3.1 Cost

This study used 2 types of data on provider perspective:

1. Primary data uses for questionnaires to collect the data on labor time of health personal sushi as doctors who spend for each cost center.

2. Secondary data uses to collect in labor cost, capital cost and material cost form department of Human resource, Finance, Nursing, Technical, Maintenance and supplies, Planning and Evaluation, and Gynecology according to the document report or IT system. The details are on table 4.1.

Table4. 1 Cost identification and direct cost determination 36

Cost components	Typeof data used	Instrument	Cost determination	Unit
1. Labor Cost (LC) Personal such as: doctor, nurse, and health worker. Include their salaries and fringe benefits was collected.	-Primary data -Secondary data	-Time table -Record form (Financial department	Time worked	THB/year
2. Capital cost (CC) - Resources that last longer than a year or price more than 5,000 THB such as building, Office, Ward and equipment.	-Secondary data	-Record form (Supply &Maintenances and Technical & Maintenances)	Time used or space used	THB/year
3. Material cost (MC) Resources that use less than one year and unit cost under 5,000THB such as: supply in drugs, syringes, small equipment and operation & maintenance in electricity	-Secondary data	-Record form (Supply &Maintenances)	-Weight per volume in supply and time used -Space used in operation & maintenance	THB/year

All capital costs and consequences that occur beyond 1 year will be discounted into the present value of base year form data. The formula:

$PV = FV*(1/(1+r)^t)$

PV = present value

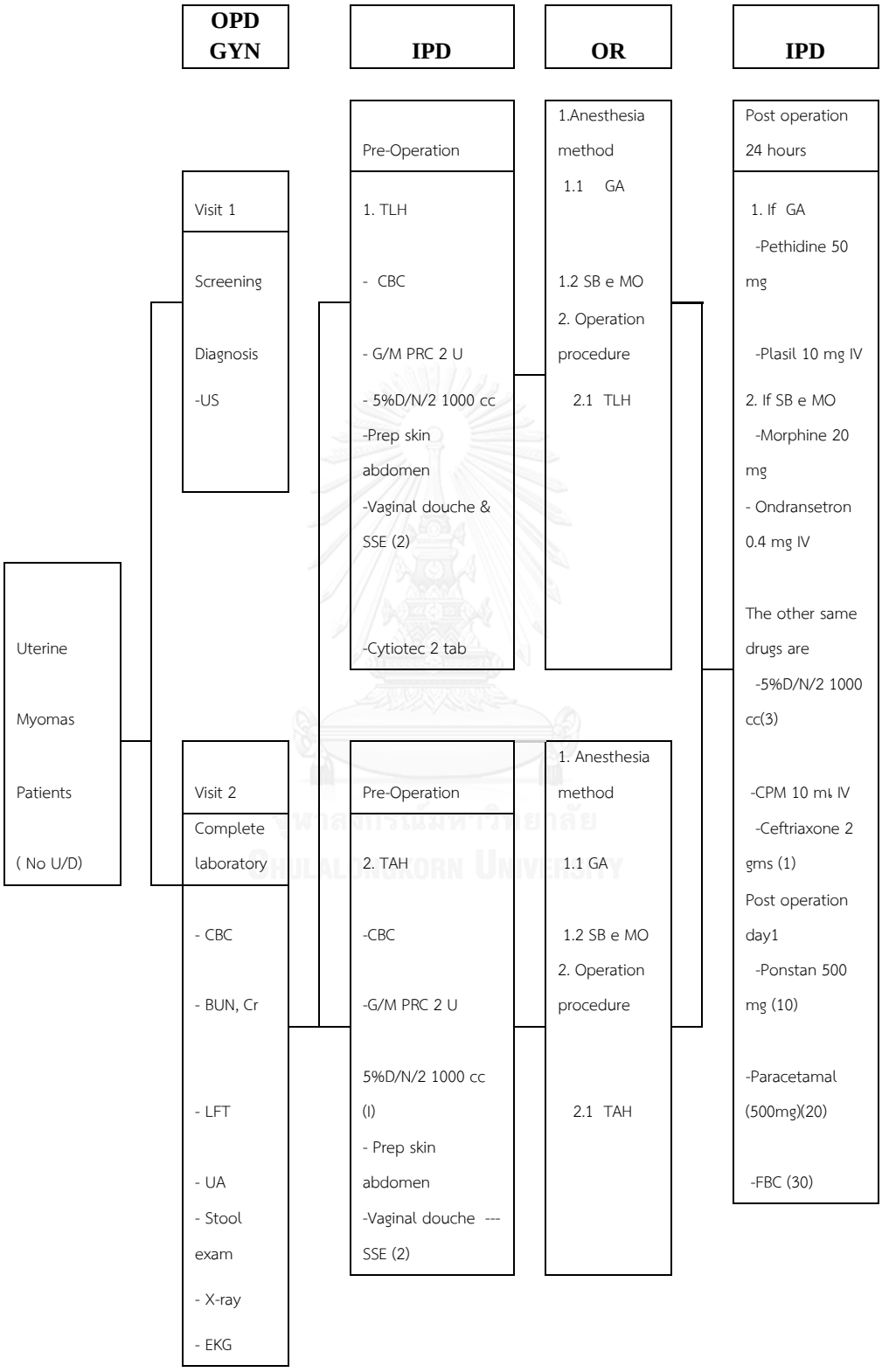
FV = future value

r = discount rate

t = the duration of the time at year t

Discount rate of 3% per year is used in calculating costs and outcomes of the model in base-case analysis and discount rate 0% and 6 % are used in one way sensitivity analysis.

Figure4. 1 Flow of uterine myoma patients who were treated by TLH and TAH



4.3.2 Effectiveness

According to the operation treatment, patients are divided into two groups after select the sample from target population, and follow the postoperative from patient's record until they left the hospital. The patients who had a good healing wound without any complications were successful outcome of treatment. If the patients had the complication during the operation or post operation (short term complication) were not successful outcome.

The complications from the literature found that the intra operation were the injury to blood vessels requiring a blood transfusion and injury to the intestines, rectum, and urinary tract (including ureter and urinary bladder). And postoperative complications were categorized into major and minor. Major postoperative complications included postoperative bleeding and reoperations according to Clavien and Dindo classification (table 4.2) II–III; minor postoperative complications according to Clavien and Dindo Classification I–II included hematomas, vaginal bleeding, wound infections, dysuria, urinary tract infections, and fever (Elessawy et al., 2015).

Table4. 2 Dindo Classification of Surgical Complications Grades Definition (Clavien et al., 2009)

Dindo Classification	Definition
Grade I:	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Acceptable therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
Grade II:	Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
Grade III:	Requiring surgical, endoscopic or radiological intervention
Grade III-a:	intervention not under general anesthesia
Grade III-b:	intervention under general anesthesia
Grade IV:	Life-threatening complication (including CNS complications)‡ requiring IC/ICU-management
Grade IV-a:	single organ dysfunction (including dialysis)
Grade IV-b:	multi organ dysfunction
Grade V:	Death of a patient

4.4 Data source

4.4.1 Patient's data

Patient's data were collected from the medical records**.** This study extract patient document of uterine myoma patients who were treated by TLH and TAH according to the eligible criteria from October 1st, 2013 to September 30th, 2015. The number of uterine myomas patients who were operated by TLH and TAH were different number because of small sample size. This study used the standardization for adjusting the value of risk ratio in mobility rate.

Standardization is a set of techniques used to remove as far as possible the effects of differences in age or other confounding variables when comparing two or more variables. The standardization procedures aim at comparing differences in health or in health care expenditures between subgroups of the population after controlling for observable morbidity differences. There is a close analogy between this problem and the issue of risk adjustment in health insurance. Traditional methods of risk adjustment are analogous to indirect standardization. A method of risk adjustment based on direct standardization does remove the incentives for risk selection, but at the cost of violating a neutrality condition, stating that insurers should receive the same premium subsidy for all members of the same risk group.

There are two methods of standardization commonly used in epidemiological studies, and these are characterized by whether the standard used is a population distribution (direct method) or a set of specific rates (indirect method). Both direct and indirect standardization involves the calculation of numbers of expected events, which are compared to the number of observed events. Concept of indirect standardization used if we want to compare a small population (e.g. province, city, workers in a given factory) to a larger population (Schokkaert & Van de Voorde, 2009).

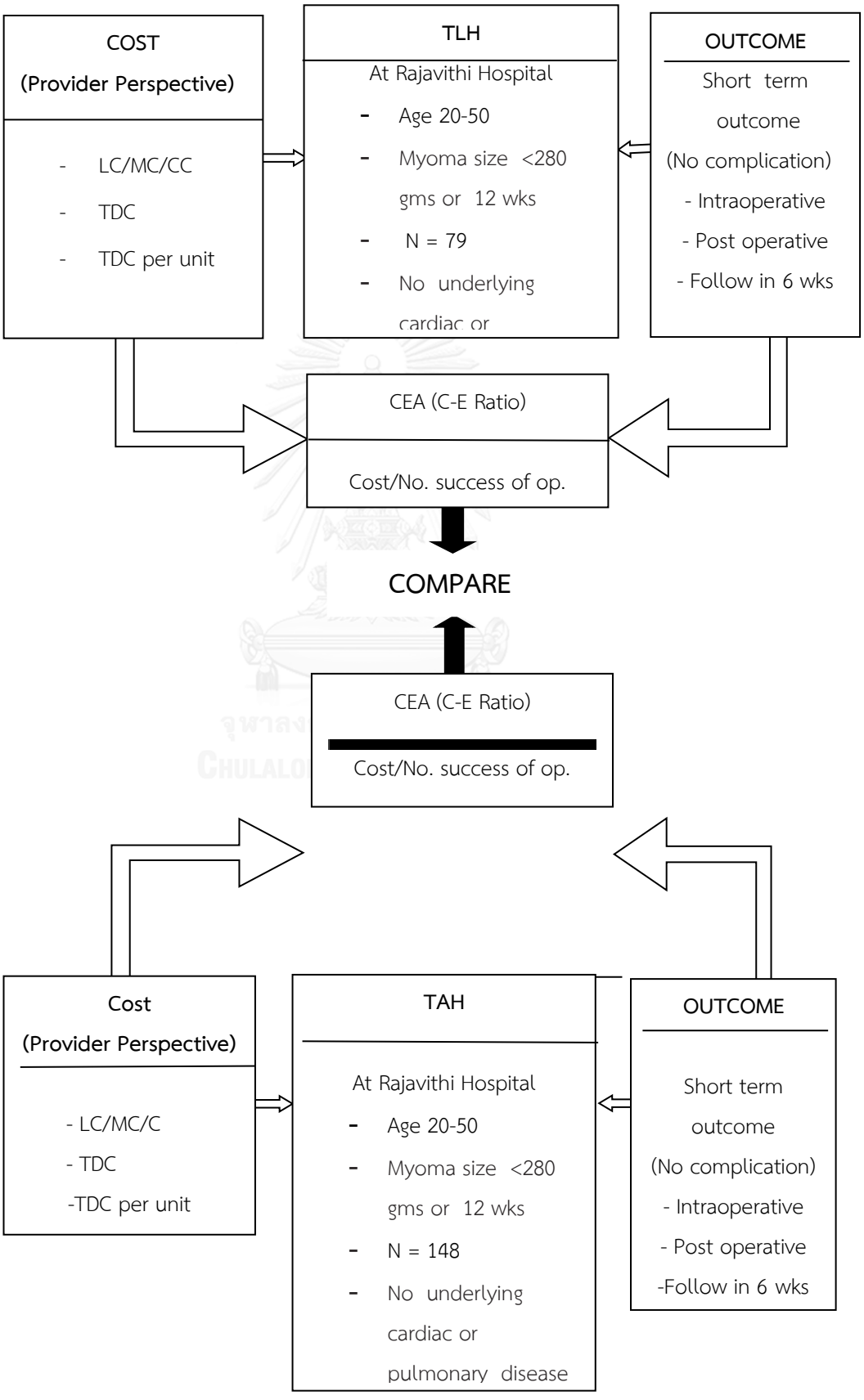
Calculate standardized population ratio

$$= \frac{\text{Observed number of event (O) X 100}}{\text{Expected number of event (E)}}$$

For costing, the data were collected retrospectively from hospital accounting documents and medical record of patients in OPD, OR and IPD in Gynecology's department of Rajavithi Hospital.

4.5 Conceptual framework

Conceptual framework



4.6 Data analysis

4.6.1 Database diagram

Step1: design database diagram

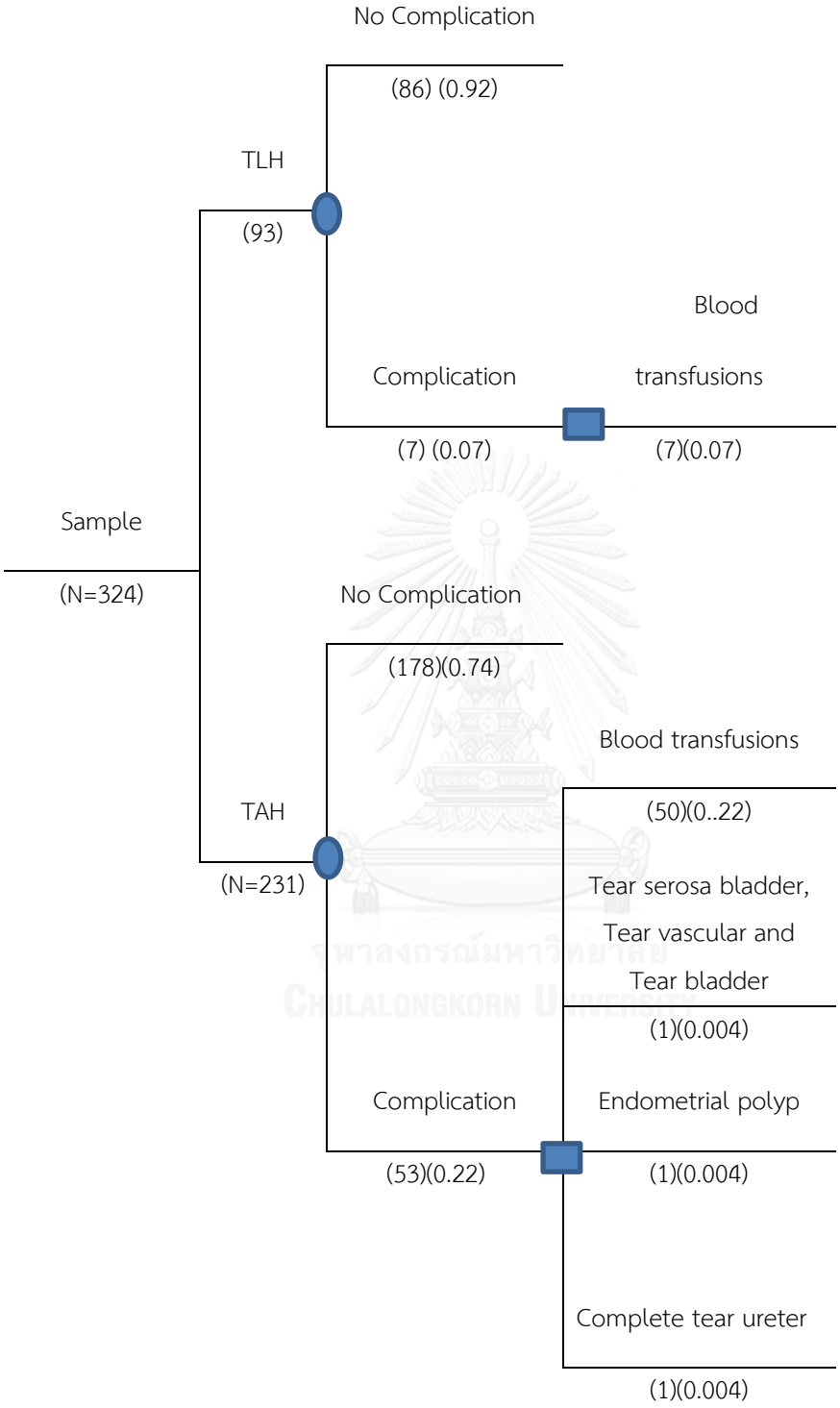
Database diagram was designed to estimate the cost of treatment and follow up for the different outcome after treatment. The diagram algorithm was built according to available data and the actual effect of treatment. After following the eligible criteria from the target population was done.

Medical records were based for available data after the operation treatments. They have been come out some complication, and two treatments have different intra-operative complications in table 4.3 the patients got blood transfusion 7 cases of TLH and 50 cases of TAH. The other complication of TAH were 1 case tear serosa bladder, tear vascular and tear bladder, 1 case endometrial polyp and 1 case complete tear ureter.

Table4. 3 Summary of the complication in two groups of the patients 44

No	Type	TLH (93n)	TAH (231n)	Total (n)
1	Blood transfusions	7	50	57
2.	Tear serosa bladder, Tear vascular And Tear bladder	-	1	1
4	Endometrial polyp	-	1	1
5	Complete tear ureter	-	1	1
	Total	7	53	60

Figure4. 2 Data diagram of complication in TLH and TAH in uterine myoma patients



Step 2: Probabilities calculation

This study analyzed the cost-effectiveness of TLH and TAH then estimate the probabilities of different health outcome after the operation. This study did the retro perspective for number of different outcome, the formulas are:

The probabilities of no complication after TLH

$$= \frac{\text{The number of no complication after TLH}}{\text{Total patients undergo TLH}}$$

The probabilities of complication after TLH

$$= \frac{\text{The number of complication after TLH}}{\text{Total patients undergo TLH}}$$

The probabilities of no complication after TAH

$$= \frac{\text{The number of no complication after TAH}}{\text{Total patients undergo TAH}}$$

The probabilities of complication after TAH

$$= \frac{\text{The number of complication after TAH}}{\text{Total patients undergo TAH}}$$

Step 3: estimate cost calculation

Estimates cost of no complication of 2 treatments

= Prob. of no complication of 2 treatments X Cost of no complication of 2 treatments

Estimates cost of complication of 2 treatments

= (Probabilities of complication of 2 treatments X (Cost of 2 treatments + (Probabilities of treatments successful or no successful about complications X cost of treatment which has complications)))

Total estimation of costs

= Estimated cost of complication + estimated cost of no complication

In this study only calculated cost of no complication of 2 treatments because of the limit of time and variable data.

4.6.2 Cost analysis

This study used the provider perspective to analyses cost from retrospective data. This study calculated the cost of 2 treatments from the patients had stayed in the hospital until they left the hospital in out-inpatient treatment and operation treatment. The detail is in table 4.4.

Table 4. 4 Costing steps during different treatments

Steps	Costing category	TLH	TAH
1.	Out-patient treatment	Including	Including
2.	In-patient treatment	Including	Including
3	Operation treatment	Including	Including
	Total direct cost	Sum of 1, 2, 3	

In this study used direct cost allocation criteria for direct allocation at OPD GYN is by number of patients, OR GYN is by time worked and number of patients and per minutes of time work and IPD GYN is by number of hospitalized stay.

Table 4. 5 The calculation of each service part of uterine myomas patients who was done TLH and TAH operations: 48

Treatment Total direct cost (THB)	Unit cost (THB)
OPD GYN	Per case
OR	Per case, and per minutes of time work
IPD GYN	Per length of stay in hospital

4.6.3 Effectiveness analysis

The following types of outcome measures were defined as the primary outcomes are return to normal activities, satisfaction and quality of life, intra-operative visceral injury, bladder injury, ureter injury, bowel injury, vascular injury, major long-term complications, fistula,

pelvi-abdominal pain, primary dysfunction, bowel dysfunction, pelvic floor condition (prolapse),sexual dysfunction(Johnson 2005b; Kluivers 2008)..

Secondary outcomes are operation time, other intra-operative complication, bleeding, hematoma, short-term outcomes and complications, length of hospital stay, infections , vaginal cuff, abdominal wall or wound ,urinary tract infection , febrile episodes or unspecified infections ,thromboembolism and the cost of treatment.

Surgeries, of course, come with a host of risks, including death. In addition to the expected risks such as bleeding, infection and anesthetic problems, gynecological surgeries pose a set of unique risks. Due to the close proximity of the female genital organs to the bowel and urinary tract, gynecological surgeries present risks for intra-operative injury to the ureters, bladder and bowel as well as the major pelvic blood vessels. Postoperative complications specific to gynecologic surgery include hemorrhage, infection, thromboembolism, and visceral injury. Such complications significantly prolong the duration of hospital stay and increase the cost of surgery manifold. It is therefore imperative that, along with providing curative gynecological services, thorough steps be taken to prevent post-operative complications. (Ali & Mundkur, 2016)

Although major morbidities and mortalities were rare, women who underwent LH were less likely to develop thromboembolic events (0.68%vs. 0.84%, odds ratio (OR) 0.85 (0.77–0.93)), require blood transfusions (2.4 % vs. 4.7 %, OR 0.58 (0.55–0.61)),and sustain bowel perforation (0.07 % vs. 0.13 %, OR 0.56 (0.42–0.74)). The mortality rate was also lower in the LH group (0.01 %) compared with the AH group (0.03 %, OR 0.48 (0.24–0.95)) (Wiser, Holcroft, Tulandi, & Abenhaim, 2013)

4.6.4 Cost- effectiveness analysis

Cost effectiveness ratio:

$$\text{C-E Ratio} = \frac{\text{Cost}}{\text{Effectiveness}}$$

After calculation the cost and effectiveness, calculating the cost-effectiveness analysis, compare the two ratios of the cost divided effectiveness, the less ratio, the more cost treatment effectiveness

4.6.5 Sensitivity analysis

This study analyzed only one hospital and the present year in Rajavithi hospital. To allow conclusion and comparison, a sensitivity analysis was performed, demon stationing to what extent the result would change in conditions other than those used in present study applied. Many factors must be taken into account when comparing our data with the others hospital and country. However, the sensitivity analysis in the present study indicates that all realistic conditions, the economic consequences described here would remain unchanged qualitatively.

A sensitivity analysis was conducted to assess how differential costs would have changed if all laparoscopic procedures had been undertaken with a cheaper disposable vaginal tube (i.e., decreasing the price of the Mc Cartney tube by 50%) and shortening of the hospital stay with one day in the laparoscopy group, based on an expert opinion of evolving laparoscopic practice. In this scenario we assumed that there would be no impact on health outcomes from this change in policy (Bijen et al., 2009)

CHAPTER V
RESULTS

5.1 Characteristics of Patients

The study results were analyzed from Excel 2010, by means of basic information of target population There were 324 target population of uterine myomas. The total laparoscopic hysterectomy patients were 93 and the total abdominal hysterectomy patients were 231. Patients' characteristics by the surgical group are shown in Table 5.1. No statistically significant differences were observed in mean age, mean BMI, ethnicity distribution, or parity distribution between the three surgical groups. The total patient population age ranged from 21 to 50 years with the total laparoscopic hysterectomy (TLH) patients were average age 45.55 years older than total abdominal hysterectomy (TAH) patients whose average age were age 42.19 years. The average estimate blood loss of total laparoscopic hysterectomy (TLH) were 282.90ml and it is lower than the average estimate blood loss of total abdominal hysterectomy (TAH) which were 447.07. The average operation time of total laparoscopic hysterectomy (TLH) were 186.23 minutes higher than the average operation time of total abdominal hysterectomy (TAH) which were 119.57 minutes. The average length of hospitalization of total laparoscopic hysterectomy (TLH) were 4.54 days lower than the length of hospitalization of total abdominal hysterectomy (TAH) which were 6.20 days.

The total laparoscopic hysterectomy (TLH) with no complication were 86 (92.47%) cases and 7 (7.53%) with complication cases. The total abdominal hysterectomy (TAH) with no complication were 178(77.06%) cases and 53(22.94%) with complication case. So, the number of success outcome when adjusted with standardization population in 100 cases the success of TLH was 92.47 cases and TAH was 77.06 cases.

Table 5. 1 Summary **of** patients's information

Characteristic	Average (SD)	
	TLH (n=93)	TAH (n=231)
1. Age(Year)	45.55(4.48)	42.19(4.52)
2 .EBL(mL)	282.90(412.62)	447.07(398.5)
3. Operation time (minutes)	186.23(67.36)	119.57(36.51)
4. Length of hospitalization (day)	4.54(1.62)	6.20(2.18)
5. Effect		
Success	86 (92.47%)	178(77.06%)
Complication	7(7.53%)	53(22.94%)

5.2 Cost calculation

5.2.1 Cost calculation at OPD

Total direct cost and unit cost of in OPD GYN show in table 5.2. was 16,953,759.58 THB and unit cost per visit was 335.30 THB.

Table 5. 2 Total direct cost and unit cost at OPD GYN (year 2015)

Parameters	Number
Total Number of patient per year at OPD GYN	50,562 visit
Number of uterine myoma patients per year at OPD GYN	3,302 visit
Direct cost	
1. Labour cost	
- Medical instructors	1,740,528.00 THB
- Nurses and Technicians	7,329,586.00 THB
Total labour cost	9,070,114.00 THB
2. Capital cost	7,638,538.54 THB
3. Material cost	245,107.04 THB
Total Direct Cost	16,953,759.58 THB
Total Direct Cost per visit	335.30 THB

5.2.2 Cost calculation at IPD

Total direct cost of IPD GYN department in General ward show in table 5.3 was 7,980,248.02 THB and unit cost of IPD GYN department was 739.94 THB per day.

Table 5. 3 Total direct cost and unit cost at IPD GYN (year 2015)

Parameters	Number
Total Number of patient per year at IPD GYN	5,250 cases
Number of myoma patient per year at IPD GYN	301 cases
General ward	125 cases
Special ward (5 bed/ room)	105 cases
Special Private Room ward	38 cases
The other wards	33 cases
Total LOS of General Ward	10,785 days
Direct cost at General ward	
1. Labour cost	
- Medical instructors	297,630.29 THB
- Nurses and Technicians	4,633,965.00THB
Total labour cost	4,961,595.29THB
2. Capital cost	1,744,326.40THB
3. Material cost	127,4326.33THB
Total Direct Cost of General ward	7,980,248.02THB
Total direct cost of General ward per 1 day	739.94 THB

5.2.3 Cost calculation at operation room

Total cost of GYN operation room show in table 5.4 was 536,695,060.00 THB and total direct cost of GYN operation department was 28,3665.50 THB.

Table 5. 4 Total direct cost and unit cost at GYN operation room (year 2015)

Parameters	Number
Total Number of patient per year at OR	27,259 cases
Number of myoma patient per year at OR GYN	1,829 cases
Direct cost	
1. Labour cost	
GYN-Medical instructors	1,740,528.00 THB
Anesthesia Medical	225,446.00 THB
Anesthesia Nurse	1,545.464.00 THB
Scrub Nurses	3,278,840 .00THB
Total labour cost	1,965,974.00 THB
2. Capital cost	528,131,971.36 THB
3. Material cost	6,597,115.00 THB
Total Direct Cost	536,695,060.00 THB
Total direct cost per 1 surgery	28,3665.50 THB

5.2.4 Total direct cost

This study provide on provider perspective. It divided in two types of treatment between open surgery and laparoscopic surgery for uterine myoma patients who were treated by TLH and TAH. Total direct cost per unit of treatment for 324 population. The calculation for indirect cost of in-patients department, using unit cost of General Ward for calculating total direct cost of each treatment. This study found that for TLH cost was 35019.47 THB which is higher than TAH cost which was 34,739.5 THB.

Table 5. 5 Item of resources use for uterine myomas who were treated by TLH and TAH

Item of resource use	TLH (n=93)			TAH (n=231)		
	No.	Unit cost (THB)	Total Cost (THB)	No.	Unit Cost (THB)	Total Cost (THB)
1. OPD GYN						
Average visit (times)	1.76	335.50	590. 48	2.34	335.50	785.07
2. Operation room						
- LC	281.81	56.76	15,996.41	112.5	56.7	6,385.85
Operation time (mins)						
- CC			12,056.78			19,374.0
(per/case)						
- MC			3,606.95			3,606.95
(per case)						
3. IPD GYN						
Average LOS (days)	4.55	739.94	3,359.33	6.20	739.94	4,587.63
Total direct cost / 1 treatment surgery			35,019.47			34,739.5

5.3 Evaluation of Effectiveness

This study for compare cost effectiveness between TLH and TAH was gap of sample from rare cases. This study used standardizes populations to be clearly analysis between 2 surgery treatments from the table 5.6. The patient who had complications which were intraoperative

complications. The rate of the complication in TLH were 7.73 case per 100 operation and TAH were 77 case per 100 operations

Table 5. 6 The rate of complications in 2 surgery treatments.

Name	TLH (n=93)	TAH (n=231)
The rate of complications	7(7.53%)	53 (22.94%
The rate of no complications	85 (92.47%)	178 (77.06%)

5.4 Cost–Effectiveness analysis

From the result shown that total direct cost of total laparoscopic hysterectomy was 35,019.47 THB and total abdominal hysterectomy was 34,739.5 THB. The total direct cost calculated by concept of adjusting standardization risk per 100 cases was shown in table 5.7 total direct cost of TLH 3,501,947.00 THB and TAH 3,473,950.00 THB .the rate of effectiveness of TLH were 85% and TAH 77.06%. The cost-effectiveness Ratio(C-E Ratio) of TLH and TAH were 45,081.10 and 54,587.52 THB. From the calculation, he C-E ratio of TLH were lower than TAH.

Table 5. 7 Cost-Effectiveness Ratio (C-E Ratio) of TLH and TAH

Type of treatment surgeries	Total direct cost per unit (THB)	Total direct cost by 100 surgeries	Effectiveness (Number of no complication)	C-E Ratio (THB)
TLH	35,019.47	3,501,947.00	92.47	45,081.10
TAH	34,739.5	3,473,950.00	77.06	54,587.52

5.5 Sensitivity analysis

This study used only one hospital and collected data in 2015. To allow conclusion and comparison in different time and situation a sensitivity analysis was performed; demon stationing to what extent the result would change in conditions. However, the sensitivity analysis in the present study indicates that all realistic conditions, the economic consequences described here would remain unchanged qualitatively.

If the interest rate such as the rate increases to 6 % in the future. It will effect to total direct cost of the total laparoscopic hysterectomy which change to 19,100.91 THB and the direct cost of the total abdominal hysterectomy which change to 18,948.20 THB. The calculations for C-E ratio used number of effectiveness from adjust standardization risk, which were 85 cases of TLH and 77.06 cases of TAH. The cost-effectiveness ratio (C-E Ratio) of TLH and TAH were 20,656.33 and 24,588.89 THB. The C-E ratio of TLH is still lower than TAH that show in table 5.8.

Table 5. 8 Cost-Effectiveness Ratio (C-E Ratio) of TLH and TAH, when interest rate is 6 %

Type of treatment surgeries	Total direct cost per unit (THB)	Total direct cost by 100 surgeries	Effectiveness (Number of no complication)	C-E Ratio (THB)
TLH	19,100.91	1,910,091.09	92.47	20,656.33
TAH	18,948.20	1,894,820.00	77.06	24,588.89

If number of successful of TAH was increase to 95 cases by excluding the operations doing by the residents. The cost-effectiveness ratio (C-E Ratio) of TLH and TAH will change to

36,862.6 and 36,567.89 THB that seem to TAH is cost-effectiveness than TLH that show in table 5.9 .

Table 5. 9 Cost-Effectiveness Ratio (C-E Ratio) of TLH and TAH

Type of treatment surgeries	Total direct cost per unit (THB)	Total direct cost by 100 surgeries	Effectiveness (Number of no complication)	C-E Ratio (THB)
TLH	35,019.47	3,501,947.00	95	36,862.6
TAH	34,739.5	3,473,950.00	95	36,567.89

CHAPTER VI
CONCLUSION & DISCUSSION

6.1 Conclusion

Uterine myomas are benign tumors of uterine muscle. The prevalence of uterine myomas up to 50% of reproductive-aged women, during age 15-42 years, and consume a significant portion of the health care resources in Thailand. The symptoms are depending on their size, location such as those causing menstrual abnormalities, prolonged uterine bleeding, iron deficiency, anemia, pain, infertility, pelvic pressure, and stress urinary incontinence and consume a significant portion of the health care resources.

The clinical practice guideline was assessment of medical treatments, conservative treatments, selective uterine artery occlusion, and surgical alternatives including myomectomy and hysterectomy. The selected treatment should be directed towards an improvement in symptomatology and quality of life. The risk-to-benefit ratio must be examined individually by the woman and her health care provider. In women who present with acute uterine bleeding associated with uterine myomas, conservative management first. If the conservative treatment is not successful the physician will provide the surgery for the woman who needed.

Hysterectomy is a choice of treatment for the woman who does not preserve fertility of the uterus, and has a criterion to gynecological condition. The number of uterine myomas was 3,032 cases (6.52%) a top-third of gynecologic conditions at OPD-GYN in year 2015. Moreover, the number of in-patients was 301 cases and 271 were treated by the surgeries which were myomectomy or hysterectomy. Therefore, the study of cost effective in 2 surgical treatments will be benefit for management of the treatment for uterine myomas. And also, it will benefit to the patients, who desire for hysterectomy for the good outcomes for their life.

This study analyzed the treatment cost of 2 surgeries treatments for uterine myomas on the provider perceptive, to access total direct cost of treatments when the patient came to visit the physician at OPD-GYN with uterine myomas diagnosis until they were treated by TLH or TAH and left the hospital. The determination of the outcomes from the surgeries provide only in short term outcome, The successful operations which were the patients without complication condition until the follow up at 6 weeks after discharging from the hospital. And the complication case, which were the operations had any complication from intra or post operation in term of Dindo Classification of Surgical Complications Grades. This study aims to compare the cost- effectiveness of 2 surgical treatments with 93 cases of total laparoscopic hysterectomy and 231 cases of total abdominal hysterectomy in Rajavithi Hospital during the year 2013 to 2015.

This study used primary data and secondary data from time table and record form of financial department and supply & maintenances and technical & maintenances for determining cost components and the medical records to determine outcome of the surgeries. The result found cost -effectiveness ratio of total laparoscopic hysterectomy was 45,081.10 THB and total abdominal hysterectomy was 54,587.52THB, the C-E ratio of TLH were lower than TAH. The conclusion was TLH is more cost effectiveness compare with TAH.

A sensitivity analysis was performed to compare demon stationing to what extent the result would change in conditions by the increasing of the interest rate 6 %. The results found that the cost-effectiveness ratio (C-E Ratio) of TLH and TAH were 20,656.33 and 24,588.89 THB. The C-E ratio of TLH is still lower than TAH, but if the study excludes the surgeries done by residents, the TAH is more cost effective than TLH.

However, the interpretation of the study results should be with caution regarding the implementation of a surgical procedure to treat this disease further since this study employed only one hospital data base and a short period of time.

6.2 Discussion

Laparoscopic surgery has become the standard of care for many gynecologic operations. The comparison of laparoscopic with abdominal hysterectomy showed that costs for total laparoscopy hysterectomy were closer to, but still higher than total abdominal hysterectomy in operation costs because longer operation times and the use of disposable equipment with laparoscopy. Previous studies of outcomes in laparoscopic hysterectomy have highlighted the learning curve effect in longer operation times of TLH and surgical experience impact on complication rates. This challenges the traditional preceptor ship model of surgical education. Traditional box trainers and virtual reality simulators allow novice trainees to progress along the steep part of the learning curve before entering the operating room (Shore et al., 2015). The understanding that health care is a scarce resource and everyone cannot have everything, policy makers and health care workers must allocate resources efficiently and equitably. Economic evaluation is important to critically evaluate clinical interventions and ensure that we are implementing the most cost effective management protocols (L. Rudmik & M. Drummond, 2013).

The laparoscopic approach may offer advantages over the abdominal route in women requiring total hysterectomy, particularly with respect to minor peri-operative complications, blood loss and hospital stay. Laparoscopic hysterectomy can be safely done even during the learning curve with a low and reasonable complication rate, and a shorter hospital stay but with longer operation time. As experience is gained the operation time, complication rate and hospital stay are decreased (Vaisbuch, Goldchmit, Ofer, Agmon, & Hagay, 2006). The only trade-off appears to be

longer operating time. However, larger studies are urgently needed to address less common but significant complications, such as major vessel injury, bowel, bladder and ureteric injury, and the impact of approach on long- term clinical outcomes, such as pelvic organ prolapse and bladder dysfunction (Johnson et al., 2005b; Walsh et al., 2009). For obese patients with a BMI >35 kg/m^2 TLH is not cost effective because of the high conversion rate(Bijen et al., 2011).

Cost of surgery in equipment: the major difference in the cost of the open and laparoscopic procedures is the expense of the specialized equipment. Although one would expect equipment costs to decrease with time. There has been an increase in costs despite the increase in number of procedures performed nationwide. Over the years, the experience of the operating room (OR) staff and the surgeon have developed, which resulted in a shorter operative time and subsequently less cost. Clearly, more evidence is needed to identify the risk factors that predict successful surgical outcome in laparoscopic hysterectomy and to assist gynecologists in selecting and counseling patients who will benefit from the laparoscopic approach. The successful surgical outcome depends on experience, our results show that successful laparoscopic hysterectomy also depends on an individual surgical skills factor and that this success rate varies significantly among individuals (Wijnstra, Blikkendaal, Zwet, Paul J. M.de Kroon, & Jansen, 2012).

Although most available data suggest that TLH is more cost-effectiveness procedure than TAH. The rate of serious complications after TLH in comparison with TAH because of laparoscopic itself is part of learning curve. And another important to considering is long-term outcome in 5 or 10 year should be presented. These clinical and economic outcomes should encourage clinicians to consider greater use of minimally invasive hysterectomy procedures in patients who have no contraindications for laparoscopic or vaginal approach to hysterectomy. Significant savings are

realized when appropriate candidates receive minimally invasive procedures and are thus able to migrate from the inpatient to outpatient setting(Warren, Ladapo, Borah, & Gunnarsson, 2009).

The main reason for performing a laparoscopic hysterectomy instead of an abdominal hysterectomy is the improvement of quality of life. The data available shows that laparoscopic hysterectomy performs equally or better in terms of postoperative health and quality of life in the first weeks after surgery. In the decision for an approach to hysterectomy, the advantage of better quality of life should be offset against the increased risk of complications in laparoscopic hysterectomy (Bijen et al., 2009; Kluivers et al., 2008).

Vaginal hysterectomy (VH) is the safest route and has the best cost–effectiveness ratio, making it the first-choice option in clinical practice. When contraindications or difficulties are expected, vaginal surgery should be performed with the aid of laparoscopy when necessary or throughout the entire intervention, according to the professional opinion of the surgeon. Although AH is not currently contraindicated, there are now sufficient surgical resources for it to be relegated to the end of the list of options (Domingo & Pellicer, 2014)

Robotic surgery is well known used in many country and the outcome demonstrated the least blood loss and shortest hospital stays, despite greater case complexity. Overall complication rates were highest for abdominal procedures and similar across minimally invasive approaches. Conversion rates were four times greater in laparoscopic than vaginal or robotic hysterectomy Vaginal hysterectomy, performed in the least complex cases, had the lowest major complication rate and lowest costs. Costs for robotic surgery were similar to abdominal and laparoscopic approaches when robots were not depreciated as direct surgical expenses (Landeen et al., 2011)

6.3 Limitation of study

This study employs the retrospective descriptive analyses , and use primary and secondary from different sources, It might had a gap of information and difficult to integrate to be unity of information, so this study spent a long time for data collection because the hospital does not have the cost center for supporting data, From the retrospective study, this study could not control any factors, for comparing between the two interventions such as: number of patient, age, size of uterine myomas cases and procedure in operating including anesthesia method and experience of surgeon in which the learning curve of the doctors might be different and impact in operation time and total direct cost.

6.4 Suggestion for future study

1. The evidence regarding the use of laparoscopy versus abdominal hysterectomy was more comprehensive. While the use of the laparoscopic approach may offer advantages regarding postoperative recovery and morbidity, the future study should identify any clear benefit for the laparoscopic approach regarding fertility outcomes on myomectomies performed by laparoscopy versus abdominal hysterectomy.

2. To explore more on prospective study that can control more of the factors and more details of the study regarding the data.

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APPENDIX

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