Thesis

HYSTERECTOMY RATES FOR BENIGN INDICATIONS IN AUSTRIA 1997 - 2008

Submitted by

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Abstract

Objective Hysterectomy is the most common gynecologic operation following cesarean section and the large majority of hysterectomies is performed for benign indications (1,2). Several surveys in Europe and the USA have shown stable or decreasing hysterectomy rates since the 1980s (1,7-14). We ascertained annual hysterectomy rates in Austria from 1997 to 2008.

Methods Analysis of number of inpatient stays in Austrian public hospitals with the intervention “HYSTERECTOMY”. Data were derived from the Austrian LKF system (leistungsorientierte Krankenanstaltenfinanzierung) from the *Österreichisches Bundesinstitut für Gesundheitswesen (ÖBIG)*.

Results The number of hysterectomies performed for benign indications decreased from 12,283 in 1997 to 8,470 in 2008. This amounts to a decrease of 31%. 92% of all hysterectomies were for benign indications in 1997, compared with 89% in 2008. The age-adjusted overall hysterectomy rate decreased from 308/100,000 women in 1997 to 191/100,000 women in 2008. Between 1993 and 1997 the hysterectomy rate was relatively stable, at about 300 hysterectomies/100,000 women. But data prior to 1997 have to be interpreted with caution because the Austrian LKF system was implemented in 1997.

Conclusion The hysterectomy rate for benign indications in Austria declined markedly (by 31%) between 1997 and 2008.

Zusammenfassung

Fragestellung Die Hysterektomie ist weltweit der zweithäufigste gynäkologische Eingriff nach dem Kaiserschnitt und wird meist aufgrund benigner Erkrankungen durchgeführt (1,2). Untersuchungen in europäischen Ländern und den USA haben seit den 1980er Jahren stabile bzw. sinkende Hysterektomieraten gezeigt (1,7-14). Wir untersuchten die Hysterektomierate in Österreich von 1997 bis 2008 und den Anteil der wegen benignen Indikationen durchgeführten Uterusentfernungen an der Gesamthysterektomierate.

Methoden Analyse der Daten (Anzahl der Aufenthalte in Akutkrankenanstalten mit dem Eingriff „Hysterektomie“) des Österreichischen Bundesinstituts für Gesundheitswesen (ÖBIG) aus dem BMG-Diagnosen- und Leistungsdokumentation der Krankenanstalten.

Resultate 1997 wurden in österreichischen Akutkrankenanstalten 12.283 Hysterektomien aufgrund benigner Indikationen durchgeführt, das sind 92% der gesamten Hysterektomien; 2008 waren es 8470 bzw. 89%. Das bedeutet einen Rückgang der Hysterektomien aus benignen Indikationen um 31%. Von 1997 bis 2008 zeigte sich eine Abnahme der gesamten durchgeführten Hysterektomien um 29%. Die altersstandardisierte Rate aller Hysterektomien sank von 308 (1997) auf 191 (2008) pro 100.000 Frauen; von 1993 bis 1996 verhielt sie sich stabil um die 300/100.000 Frauen (die Daten vor 1997 sind mit Vorsicht zu behandeln, da erst ab der Einführung der Leistungsorientierten Krankenanstaltenfinanzierung (LKF) die Dokumentation eine verlässliche Qualität aufweist).

Schlussfolgerung Die Hysterektomierate in Österreich hat beträchtlich abgenommen. Die Abnahme ist vor allem auf den Rückgang der Hysterektomien bei benignen Indikationen zurückzuführen und zeigte sich am stärksten ab 2002.

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List of Abbreviations

ÖBIG	Österreichisches Bundesinstitut für Gesundheit
BMG	Bundesministerium für Gesundheit
LKF	Leistungsorientierte Krankenhausfinanzierung
MEL	Medizinische Einzelleistung
ICD 10	International Classification of diseases 10
HE	Hysterectomy
BMI	Body Mass Index
POP	Pelvic organ prolapse
ACOG	American College of Obstetrics and Gynecology
n.a.	not available

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1 Introduction

Hysterectomy is the second most common surgical procedure in gynecology (1) and in the majority of cases performed for benign conditions of the uterus, such as leiomyoma, dysfunctional uterine bleeding, pelvic organ prolapse or endometriosis (2). The procedure is considered to be relatively safe and generally associated with few complications (3,4) but long-term effects are not totally clear and thus controversial (5,6).

There are remarkable variations in hysterectomy rates among different countries and changes in rates have been observed over the last decades (1,7-14). A number of conservative and less invasive treatment options for benign conditions have been introduced (15,16). There have been dogged controversies in public media (17-23) and among health care professionals (5,24-31) on whether hysterectomy is performed too frequently and the appropriateness of indications and treatment recommendations.

In Austria there was no documentation of medical interventions in a central system before the implementation of the Austrian LKF system in 1997 (32). Thus, hysterectomy rates in Austria before 1997 are difficult to assess and rates and trends since 1997 have not been studied.

2 Background

2.1 Definition of hysterectomy

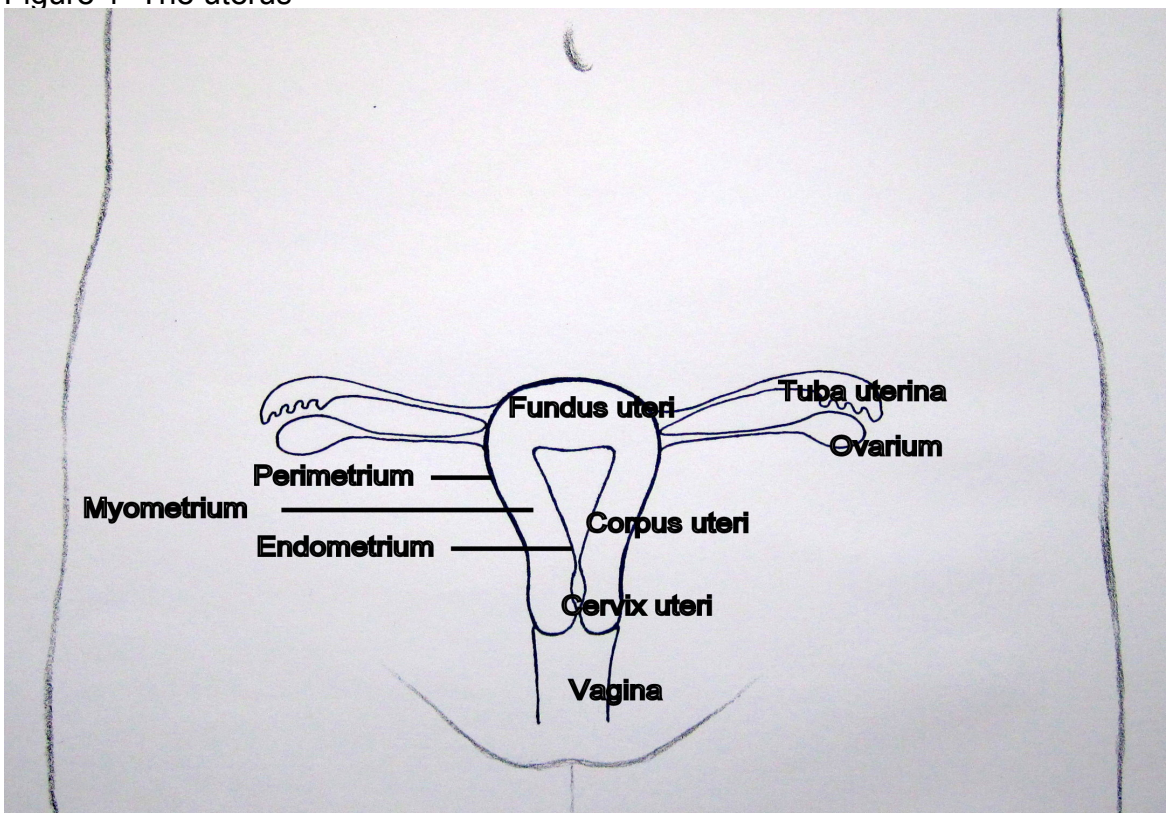
Derived from the Greek words for the uterus, *hystera*, and *ektomie*, which means to cut out, hysterectomy denotes the excision of the uterus (33). First mentioned in Greek manuscripts 2000 years ago, with early fatal attempts in the 16th century, vaginal and abdominal hysterectomy arose in the 19th century and became, with the advances in anesthesia, blood transfusion, antibiotics and surgical technique, one of the most common surgical interventions in gynecology (34).

Hysterectomies can be classified according to the route or modality (vaginal, abdominal, laparoscopic, laparoscopic assisted, robotic) and according to the extent of the excision (subtotal, total, radical).

2.1.1 Anatomical orientation

The uterus is located intraperitoneally in the small pelvis between bladder and rectum. Anatomically the uterus consists of fundus, corpus, isthmus and cervix uteri (Fig. 1).

Figure 1 The uterus



The uterine wall consists of three layers: the mucosa, called the endometrium; the muscular wall, called the myometrium; and the serous layer, the perimetrium (Fig. 1).

The uterus is held in place by condensations of connective tissue (so-called ligaments). The broad ligament (ligamentum latum uteri) is the peritoneal fold between the side of the uterus and the lateral pelvic wall. It contains the round ligament (ligamentum teres uteri), the fallopian tube, the ovarian ligament (ligamentum ovarii proprium) and the ovary, which are later on referred to as appendages of the uterus. (35)

Figure 2 Ligaments of the uterus (36)

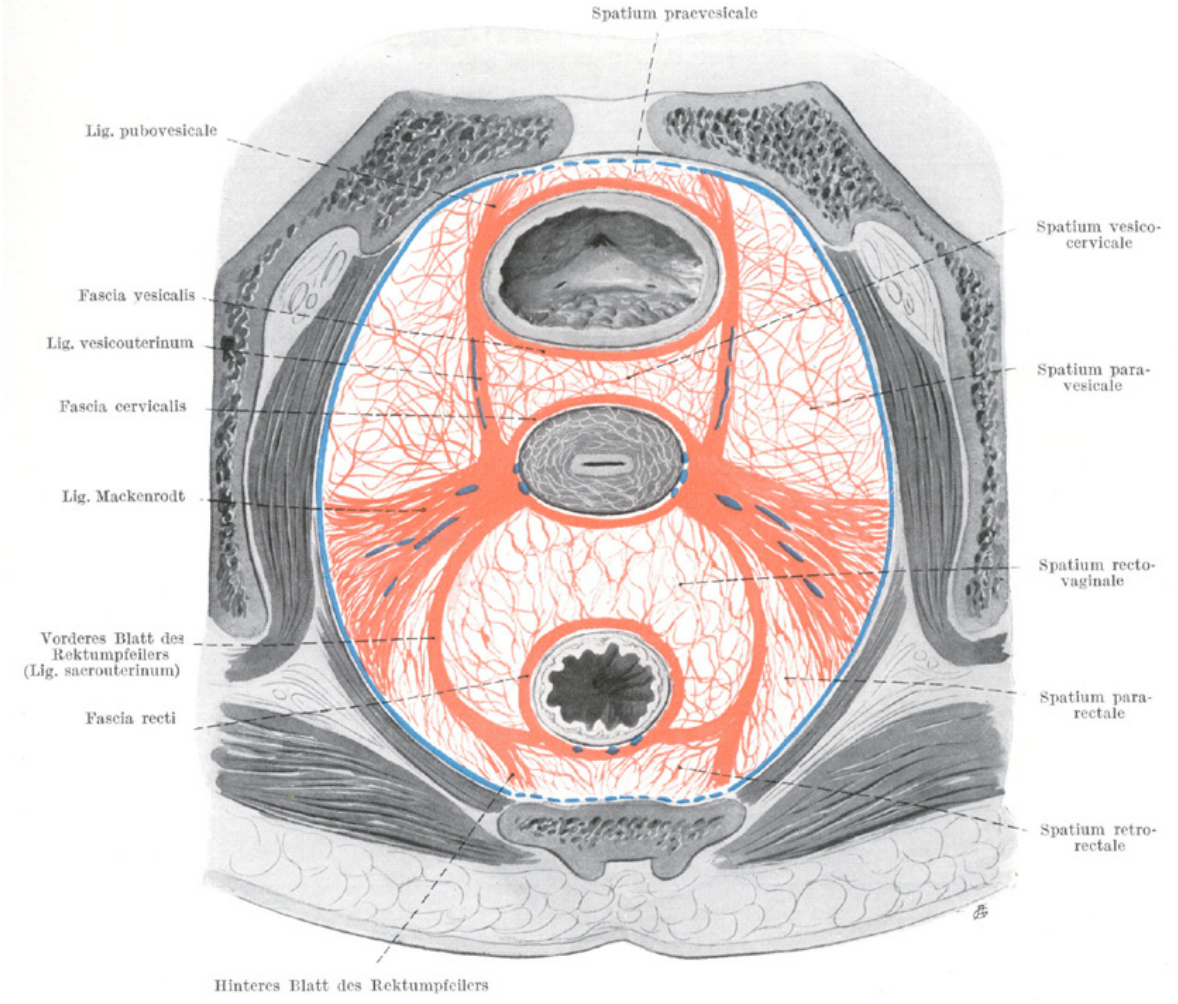
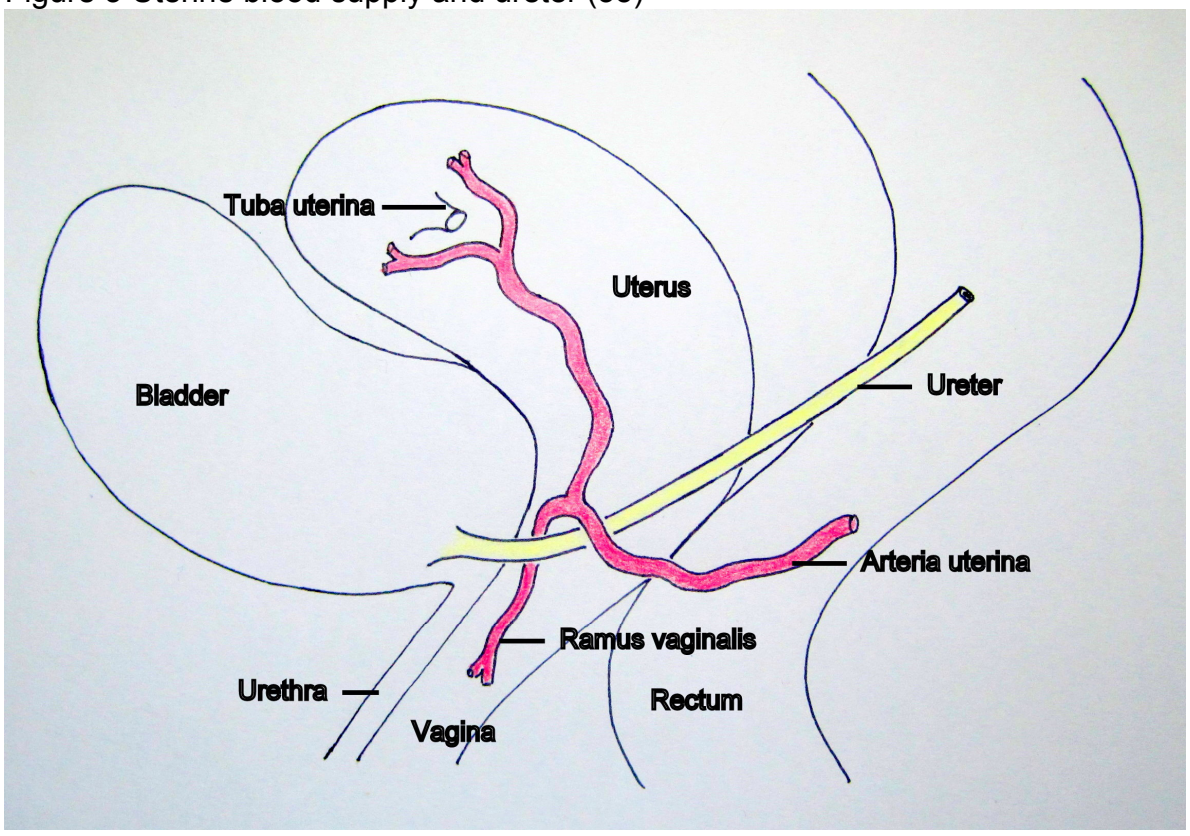


Figure 2 shows the major ligaments of the uterus. At the base of the broad ligament the cardinal ligament (ligamentum transversum cervicis or ligamentum Mackenrodt), which contains the uterine artery and the uterine vein, goes from the cervix to the pelvic sidewall. The uterosacral ligament (ligamentum sacrouterinum)

connects the cervix with the sacrum and the vesicouterine ligament (ligamentum pubocervicale) goes from the cervix around the bladder to the pubis.

The uterine blood supply comes from the uterine artery, which branches off the internal iliac artery and, coming from the pelvic sidewall, crosses over the ureter approximately 1 cm before the cervix (Fig. 3) and takes its course in the cardinal ligament to the isthmus uteri. There it ascends at the side of the uterus to the uterine horn where it divides into the ovarian and the tubal branch.

Figure 3 Uterine blood supply and ureter (35)



The innervation of the uterus arises from the plexus hypogastricus inferior and the nervi splanchnici pelvici forming the plexus uterovaginalis alongside the cervix uteri. This plexus gives caudal branches to the vagina and medial and ascending branches to the cervix, the corpus uteri and the tubes (35).

2.1.2 Types of hysterectomy: Surgical route

Basically there are three surgical routes for hysterectomy. Abdominal hysterectomy is the most frequently used surgical technique in some European countries such as Denmark (7), Sweden (11) and the UK (37) and in the USA (1). Vaginal hysterectomy is the most common surgical route for hysterectomy for benign indications in France (38) while its percentage increased in Sweden and Denmark it is the second commonly used in these countries and the USA.(1,7,11,37). Laparoscopically assisted hysterectomy was introduced in the mid-nineties with since then increasing proportion (1,7,11). In the last few years laparoscopic techniques have been performed with robotic assistance.

2.1.2.1 Abdominal hysterectomy

By definition abdominal hysterectomy is performed by laparotomy, either with a transverse or a longitudinal incision. A longitudinal or midline incision is preferred in cases where the surgeon is uncertain about what will be found such as in patients with malignancy. It provides a better exposure of the surgical field, can be extended and gives access to the upper abdomen. For cosmetic reasons a low transverse incision (Pfannenstiel's incision) is often used for gynecologic operations (39).

The hysterectomy itself begins with the elevation of the uterus. The adnexa are identified and detached, the peritoneum of the bladder is dissected carefully from the anterior cervix, and the vascular bundle of the uterine artery is skeletonied occluded and detached. The bladder, rectum and the ureter are dissected away. The vagina is opened and the uterus detached. The vaginal cuff can be closed or left open (4).

The abdominal route is the route of choice for hysterectomy for most malignant indications, with the need for a good exposure of the surgical field and in some cases a larger extent of laparotomy (4). Abdominal hysterectomy can also be performed for benign indications such as severe endometriosis, adhesions or adnexal pathology (40).

2.1.2.2 Vaginal hysterectomy

For vaginal hysterectomy the patient is positioned in the dorsal-lithotomy position. An examination under anesthesia is performed, the patient is prepared and draped and a catheter is placed in the bladder. Tenacula are placed in the cervix and traction applied. The cervix is circumcised. The vesicocervical space between the bladder and the cervix is developed. Next the pouch of Douglas is opened. The vesicocervical space and pouch of Douglas are entered by careful dissection of the bladder and the rectum. The uterosacral and cardinal ligaments are detached from the uterus on both sides. The peritoneum is opened and the uterus is brought closer to the surgeon with a downward traction on the cervix. Now the adnexa are detached, or if necessary a salpingo-oophorectomy is performed. The peritoneum and vaginal mucosa are closed (39).

Removal of the uterus by the vaginal route involves less operative exposure for the patient, lower febrile morbidity and a shorter duration of operation and hospital stay than abdominal hysterectomy (4,38,39). Vaginal hysterectomy is associated with fewer complications and better outcomes and is therefore considered the approach of choice for benign indications (40).

2.1.2.3 Laparoscopic and laparoscopic assisted hysterectomy

The use of laparoscopy for hysterectomy was introduced in the mid1990s (7) and can be classified in three types: if the uterine vessels are occluded vaginally the operation is defined as a laparoscopic assisted vaginal hysterectomy; but if the uterine vessels are occluded laparoscopically although a part of the operation is performed vaginally, it can be called laparoscopic hysterectomy. If the whole procedure is performed laparoscopically it is considered a total laparoscopic hysterectomy (39).

For laparoscopic hysterectomy the patient is placed in dorsal lithotomy position. Examination under anesthesia is performed, the bladder is drained and a uterine manipulator can be introduced. There are two ways to introduce the first cannula: The use of a Veress needle and carbon dioxide (CO_2) insufflations before the insertion of the first trocar, or the direct trocar insertion. After an artificial pneumoperitoneum is made, a space for operation is assured and the accessory

ports can be placed through the abdominal wall. The patients position is changed to Trendelenburg when accurate intraperitoneal placement is affirmed (39). Through the ports surgical instruments can be introduced and the operation can be performed in sight through the camera of the primary trocar.

Laparoscopy can be used to provide any degree of dissection from above (i.e., mobilisation of the adnexa, dissection of the round ligaments, dissection of the bladder) with completion of the hysterectomy by the vaginal route (laparoscopic assisted hysterectomy). Total laparoscopic hysterectomy denotes complete detachment of the uterus by the laparoscopic approach. For these procedures pneumoperitoneum is established and the laparoscopic dissection (for laparoscopic assisted hysterectomy) or complete detachment of the uterus is performed.

Laparoscopic hysterectomy is an alternative to abdominal hysterectomy in patients in whom it is not possible to perform a vaginal hysterectomy (40).

2.1.3 Types of hysterectomy: Extent of the resection

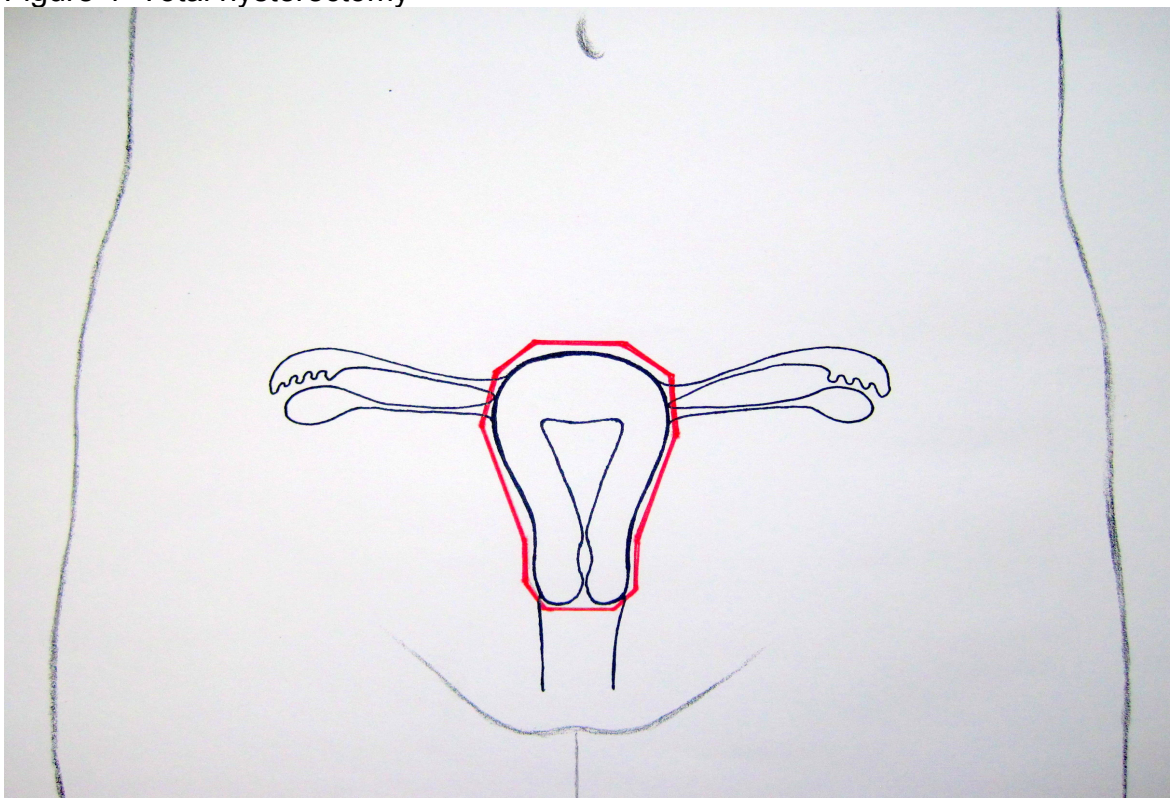
Depending on the indication for hysterectomy, there are different needs concerning the extent of the resection. While benign diseases of the uterus may be treated with subtotal or total hysterectomy, malignant indications for hysterectomy require, dependent on the severity, the location and the extent of the neoplasia, a more extended or radical resection. Hysterectomy does not imply removal of the tubes and ovaries (salpingo-oophorectomy) and can be performed with or without the removal of the tubes and ovaries. Salpingo-oophorectomy is a separate surgical intervention but can be performed together with hysterectomy depending on the indication.

2.1.3.1 Total hysterectomy

Total hysterectomy means the removal of the entire uterus (fundus, corpus and cervix) but does not imply removal of the tubes and ovaries (Fig. 4). The uterosacral and cardinal ligaments are detached from the uterus directly lateral of the cervix.

Some make a distinction between intrafascial and extrafascial hysterectomy. For benign indications the intrafascial procedure is preferred because the paracervical ligaments (cardinal ligament, uterosacral ligament, vesicouterine ligament) can be preserved (4).

Figure 4 Total hysterectomy



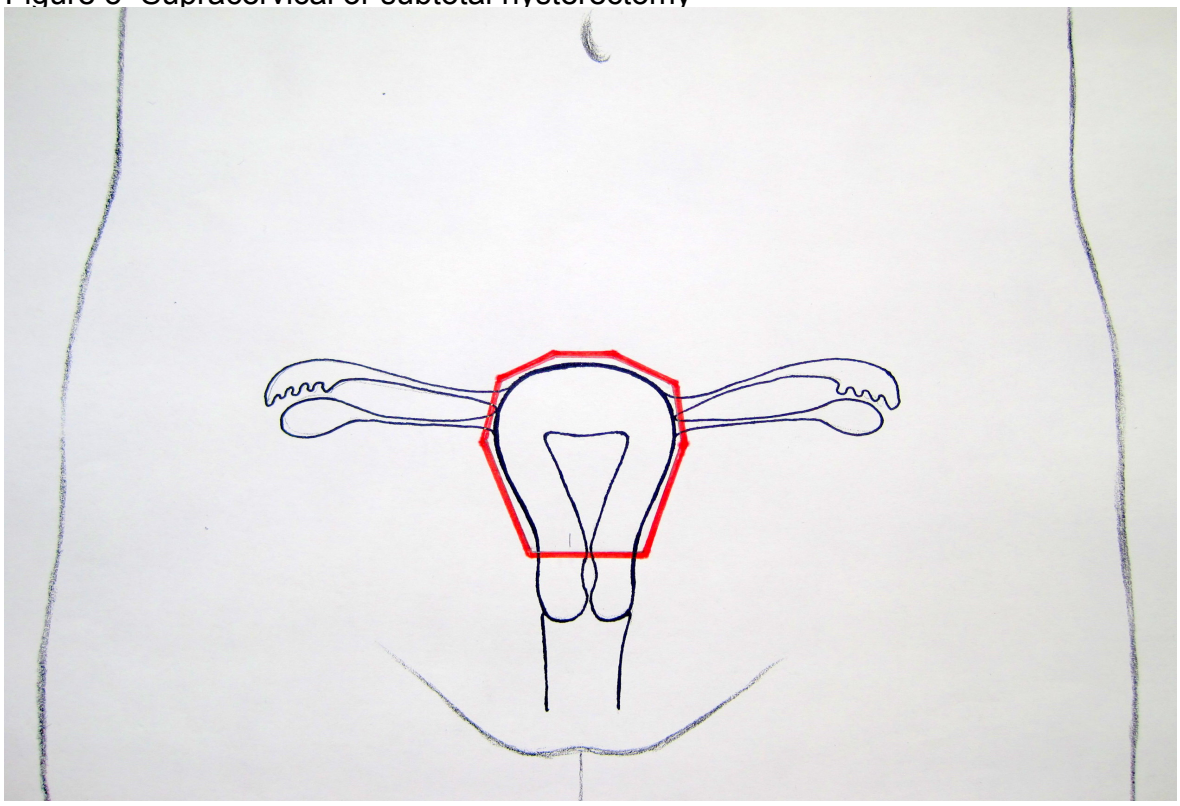
2.1.3.2 Supracervical (subtotal) hysterectomy

Supracervical or subtotal hysterectomy means removal of the fundus and corpus uteri leaving the cervix uteri intact (Fig. 5).

Subtotal hysterectomy used to be performed in lieu of total hysterectomy in medical history it was replaced by the latter because of the concern of the development of a neoplasia in the conserved cervix (41). In some regions, assumed benefits such as reduced risk of damage of the bladder, the ureter and other neuro-anatomical structures and reduced risk of vaginal prolapse after hysterectomy have led to increased rates of subtotal hysterectomy for example in Denmark an increase of 458% from 1988 to 1998 has been observed (7). A number of randomized trials systematically reviewed in the Cochrane Database by

Lethaby et al. have shown no difference in outcomes of sexual function, urinary incontinence or constipation between total and subtotal hysterectomy. There is a reduction of intraoperative blood loss and fever as well as a shorter operation time with subtotal hysterectomy but a higher incidence of ongoing vaginal bleeding. A decrease of vaginal vault prolapse could not adequately be assessed in this review (41). Thakar showed in a randomized trial no difference in outcome concerning quality of life and psychological measurements between total and subtotal hysterectomy (42).

Figure 5 Supracervical or subtotal hysterectomy



2.1.3.3 Radical hysterectomy

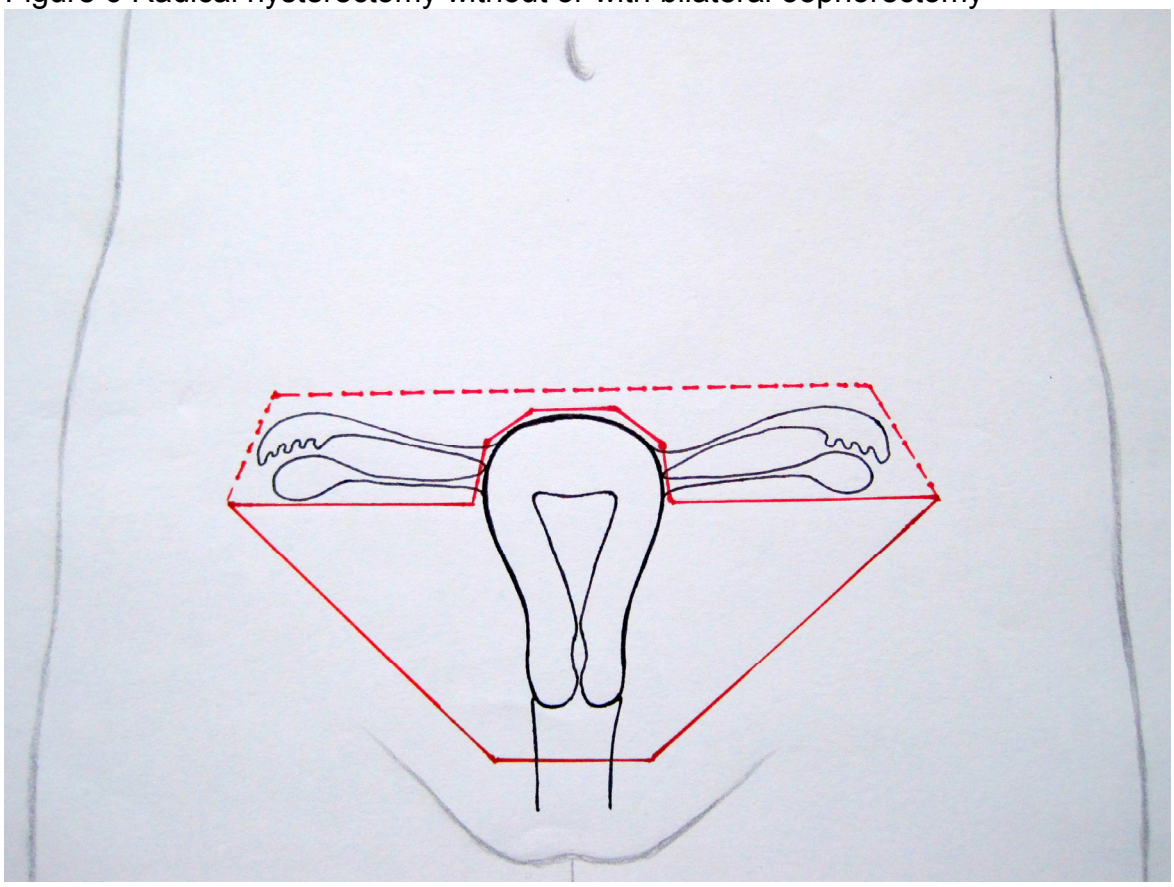
Radical hysterectomy is done only for malignant indications, mainly cervical cancer. Again, also radical hysterectomy can be done without or with oophorectomy.

The first to describe radical hysterectomies were Ernst Wertheim and Friedrich Schauta both from Vienna. The abdominal procedure is still widely

referred to as the Wertheim or Wertheim-Meigs operation and the vaginal procedure as the Schauta operation.

Radical or extended hysterectomy means that the planes of resection are moved away from the uterus. The uterine arteries are detached at their origin from the internal iliacal arteries, the parametrial and paracervical tissue right next to the pelvic sidewall. The pelvic and paraaortic lymph nodes are, depending on the extent of the tumor, dissected and removed (4).

Figure 6 Radical hysterectomy without or with bilateral oophorectomy



2.1.3.4 Oophorectomy

Oophorectomy (salpingo-oophorectomy) or ovarectomy is the excision of one or both ovaries (usually with fallopian tubes) and means semicastration or castration (33). Oophorectomy is performed for lesions of the ovary, to ablate estrogen production (i.e., in women with breast cancer), or prophylactically to reduce the risk of ovarian cancer. Oophorectomy is a surgical procedure for itself and does not necessarily go along with hysterectomy, though it is performed together with

hysterectomy for benign indications in postmenopausal women to prevent future ovarian cancer (2). Opinion has shifted on the benefits of prophylactic oophorectomy in pre- and perimenopausal women as a recent study shows that the long-term risk through estrogen-deficiency due to loss of ovarian function is a bigger disadvantage for survival than the risk of ovarian cancer (43).

2.2 Indications for hysterectomy

As the second frequent gynecologic operation after cesarean section, hysterectomy has many indications. These can be divided into benign and malignant conditions and obstetrical indications. The large majority of hysterectomies are performed for benign indications.

2.2.1 Hysterectomy for benign indications

Benign indications for hysterectomy include uterine leiomyomas (fibroids), dysfunctional uterine bleeding, genital prolapse, endometriosis and adenomyosis uteri, chronic pelvic pain, severe bilateral adnexal inflammatory disease and endometrial hyperplasia with atypia.

Uterine leiomyomas are a frequent indication for hysterectomy. Depending on their size and location uterine leiomyomas can cause excessive bleeding, pelvic pain or pressure, back pain, urinary symptoms, silent ureteral obstruction and anaemia. Hysterectomy is indicated for symptomatic fibroids in women who do not wish to preserve fertility, for asymptomatic leiomyomas only for silent ureteral obstruction or if rapid growth of the tumor raises suspicion of a leiomyosarcoma. Other causes of excessive bleeding or pelvic pain must be excluded.

Another frequent indication for hysterectomy is dysfunctional uterine bleeding. As a diagnosis of exclusion the patient has to be examined for underlying causes, such as uterine leiomyomas, pregnancy, polyps, endometrial or cervical neoplasia, endometriosis or pelvic infection. Dysfunctional uterine bleeding is initially treated medically; hysterectomy is indicated if the bleeding is

severe and chronic and does not respond to medical therapy or if an acute uterine bleeding cannot be controlled otherwise.
Hysterectomy is also performed for genital prolapse (i.e., uterine prolapse, cystourethrocele, enterocele and rectocele), particularly beyond the introitus of the vagina but nonsurgical management is also possible.

There exists a range of medical and surgical treatments for endometriosis. Endometriosis can cause pelvic pain, dysmenorrhoea, dyspareunia, irregular bleeding and infertility. Surgical procedures for endometriosis like hysterectomy can be performed when the uterus is affected; bilateral salpingo-oophorectomy is only indicated when conservative therapy fails.

Adenomyosis uteri, defined as isles of endometrial like cells inside the myometrium, is treatable with gonadotropin-releasing hormone agonists but hysterectomy is seen as the definitive treatment.

Chronic pelvic pain is an uncommon indication for hysterectomy. Hysterectomy can be considered when chronic pelvic pain has been carefully investigated to rule out gastrointestinal, urogenital, musculoskeletal and psychiatric conditions.

For severe bilateral adnexal inflammatory disease and recurrent pyometra hysterectomy is indicated if preservation of fertility is not desired.

Hysterectomy is not indicated for endometrial hyperplasia without cytologic atypia but is recommended for endometrial hyperplasia with atypia. (2)

2.2.2 Hysterectomy for malignant indications

The treatment of malignant disease is guided by the location, extent and severity of the lesion. Hysterectomy may be performed for cervical intraepithelial neoplasia if it cannot be cured by conisation. It is the treatment for early invasive cervical carcinoma, endometrial adenocarcinoma and malignant mesenchymal tumors of the uterus. Hysterectomy is often part of the surgical management of tubal or ovarian cancer or carcinoma of the colon, rectum or bladder. In rare cases hysterectomy is indicated for persistent gestational trophoblastic disease if the patient does not desire to preserve fertility (2).

2.2.3 Hysterectomy for obstetrical indications

Obstetric indications for hysterectomy are usually emergencies. Emergency hysterectomy may be necessary for massive uncontrollable hemorrhage due to uterine atony, uterine rupture or laceration of a major blood vessel. Hysterectomy is also indicated for septic endometritis with pyometra after abortion and might be performed for inversion of the uterus after delivery (2).

2.3 Complications of hysterectomy

2.3.1 Mortality of hysterectomy

Mortality is between 6 and 11 per 10,000 after hysterectomy for nonmalignant and nonobstetric indications, from 29 to 38 per 10,000 when pregnancy is involved, and from 70 to 200 per 10,000 when it is performed for malignant disease (3).

2.3.2 Intraoperative complications

The major intraoperative complications associated with hysterectomy are hemorrhage and injury of the bowel, bladder or ureter (4).

2.3.3 Postoperative complications

Complications after hysterectomy include hematoma or abscess in the minor pelvis, abdominal hemorrhage, vaginal bleeding, fever, urinary retention, stenosis or obstruction of the ureter, pelvic organ fistula, infection of the urinary tract and intestinal occlusion (4,38).

2.3.4 Convalescence after hysterectomy

Traditionally patients are considered to be recovered, able to work and to have sexual intercourse 6 weeks after the operation (5). However there is not much

evidence to this practice. In a Danish study the subjective feeling of illness after hysterectomy was assessed. Patients where asked 4 months after the operation about their time of return to work and the complete absence of any feeling of illness. These women reported a median duration of feeling ill 9 weeks after abdominal hysterectomy and 7 weeks after vaginal hysterectomy. Since there is little research on this subject the authors recommend further investigation (44).

The controversy whether hysterectomy is followed by a prolonged convalescence was raised by the British psychiatrist D.H. Richards in 1974. He reported a higher frequency of depression in women who had had hysterectomy and an average self-reported period of convalescence after hysterectomy of 11.9 months (45). Symptoms reported by some women during convalescence period in this study included reduced capacity, fatigue, vertigo, insomnia, hot flashes, urinary and bowel symptoms, circular depressive mood and sexual problems (45). If these symptoms occur intensified, added or persist longer than expected, a disordered convalescence with chronic devolution and development of long-term complications is possible (5).

2.3.5 Does hysterectomy cause long-term adverse effects?

There has long been controversy whether hysterectomy causes long-term health problems and has a harmful impact on the life of patients after hysterectomy. While self-help organizations claim hysterectomy to be responsible for a wide range of symptoms such as sexual problems, urinary and bowel symptoms, psychiatric symptoms, fatigue, insomnia, social and psychological difficulties and diverse pain symptoms (19), data are lacking for many important long term effects of hysterectomy (6) and there seems to be a discrepancy between cross-sectional data and prospective studies (46).

2.3.5.1 Urinary tract symptoms

A review in 2001 could not find a persistent negative effect of hysterectomy on lower urinary tract function (46) and an identical twin analysis found no evidence that hysterectomy leads to higher rates of stress urinary incontinence (47). In contrast another review about the impact of hysterectomy on the development of

urinary incontinence found that the summery of odds ratio for urinary incontinence among women older than 60 years increased by 60% but were not increased for women younger than 60 years (48).

A large population-based cohort study in Sweden done by Altman et al. found an increased risk for subsequent stress urinary incontinence surgery after hysterectomy. In the cohort of 165,260 women who had undergone hysterectomy the rate of stress urinary incontinence surgery was 179/100,000 person years while in the control group of 479,605 women who have not had hysterectomy the rate of stress urinary incontinence surgery was 76/100,000 person years. This is more than double as high in women of the exposed cohort compared with those in the unexposed cohort but also only observable in very large cohorts. The author suggests that the acute pelvic floor tissue trauma due to hysterectomy could be responsible for adverse effects with a chronic and progressive evolution (49). Other recent studies also report slightly increased risk of developing stress urinary incontinence, lower urinary tract infections and incomplete emptying after hysterectomy (50,51).

2.3.5.2 Bowel symptoms

Gynecological patients have a high prevalence of bowel symptoms but constipation, evacuation problems and irritable bowel syndrome after hysterectomy concern a small group of women and are probably of multifactorial origin, including neurological, anatomical, hormonal, pharmacological and psychological aspects (52). Although women may date the onset of bowel symptoms to hysterectomy, mobility disorders might also predate this intervention (53). Recent prospective studies could not confirm that hysterectomy for benign conditions is associated with constipation (54-56) but there may be a slightly increased risk of mild anal incontinence symptoms, especially in patients with prior obstetric sphincter injury (54,55).

2.3.5.3 Pelvic organ prolapse

Pelvic organ prolapse, a downward descent of the female pelvic organs, is common but its epidemiology is plagued by problems of definition. Most adult women have some loss of uterovaginal support as they age but many of them are not symptomatic (57). Hysterectomy may increase the risk of subsequent pelvic organ prolapse (57) and surgery for pelvic organ prolapse (58).

2.3.5.4 Endocrine effects

There are several reports of premature ovarian failure and earlier onset of menopause in women who underwent premenopausal hysterectomy with ovarian conservation (59-62) and of a positive correlation between the age at surgery and the age of menopause (61). Women who underwent hysterectomy reached menopause nearly four years earlier than women in the comparison group independent of smoking, BMI or unilateral ovarectomy although their FSH was < 10 IU/L preoperatively (62). Ligating the uterine artery also affects the ovarian blood supply (35) which might lead to lower ovarian stromal blood flow indices (63) and subsequent changes in ovarian histology (64). Due to premature ovarian failure and earlier menopause women might be at increased risks for osteoporosis, lower bone-density and cardiovascular diseases (5) but at lower risk of ovarian and breast cancer (65).

2.3.5.5 Cardiovascular risk

Several studies have reported an increased risk for cardiovascular disease in women with perimenopausal bilateral oophorectomy (65,66) but a large observational study has shown that women with previous hysterectomy, regardless of oophorectomy status, had a worse cardiovascular risk profile at the baseline than women without hysterectomy and a higher incidence of cardiovascular disease. The impact of hysterectomy was not significant in this study after adjustment for demographic variables and cardiovascular risk factors (67).

2.3.5.6 Cancer risk

Hysterectomy eliminates the future risk of endometrial and cervical cancer and a decreased risk for breast and ovarian cancer was found in women with previous hysterectomy (65).

2.3.5.7 Adhesions of the peritoneum and lesions and scars of the abdominal wall

Adhesions of the peritoneum are uncommon due to succeeded uncomplicated hysterectomy since the uterus is completely covered by the peritoneum. When hysterectomy is performed in women with prior operations, history of peritoneal inflammation and endometriosis, where adhesions have already developed, symptoms such as abdominal pain in dependence of bowel movements or filling status of the bladder or during sexual intercourse and various bowel symptoms might occur due to re-adhesions (5).

Abdominal hysterectomy requires an incision of the abdominal wall and especially the Pfannenstiel's incision might lead to constriction of the function of the abdominal wall in mobility of the abdominal wall layers and the interaction of the abdominal muscles and hence lead to an abdominal protrusion, development of a hollow-back and lumbosacral back pain (5).

These are adverse long-term effects which are not specific for hysterectomy but can occur after abdominal laparotomy.

2.3.5.8 Impact on sexuality

By definition removal of the uterus is an operation that affects various anatomical structures and the nerve supply of this area (68,69). Patient concerns regarding hysterectomy affecting sexual functioning such as frequency and intensity of orgasm, lubrication, sexual arousal, sexual desire and satisfaction are legitimate.

A number of studies have addressed the effect of hysterectomy on sexuality (68). Most studies show that hysterectomy has no adverse effect on sexual functioning but rather improves or causes no change in sexual life (70,71).

However most of the evaluated studies are poorly designed, with many confounding factors not taken into account (70).

One of the most important factors for postoperative sexuality seems to be preoperative sexual function and enjoyment. Women who experienced an improvement in their sexual life after hysterectomy reported a higher frequency of sexual intercourse and masturbation preoperatively. In these women the relief of symptoms appears to let patients resume their normal sexual activity. In contrast women with a postoperative deterioration in their sexual life often reported a poor or absent partner relationship (72).

However, there is a physiologic basis for adverse changes experienced by some women after hysterectomy (68). Lowenstein et al. found a quantifiable decrease of sensation at the anterior and posterior vaginal wall (73) and although the majority of women report unchanged or improved sexual function a subgroup of 10 – 22% experience a change for the worse (71,73,74) even though many of these women were satisfied with their sexual life and lived in stable partnerships before surgery (74).

An important factor for sexual outcome after hysterectomy may be the reason for the intervention. Removing the cause of gynecological symptoms such as heavy bleeding or pain is likely to have a positive effect on sexual life postoperatively. However, some studies lacked a comparison of sexuality of asymptomatic women, women who were symptomatic immediately prior to surgery and long term sexual outcome after surgery (68).

2.3.5.9 Psychological outcome and quality of life

There are concerns that hysterectomy entails higher risks of subsequent depression, fatigue, nervousness, other psychiatric symptoms and psychiatric referrals (45,75). Richards even coined the term “post-hysterectomy syndrome” (45). A series of prospective studies on psychological outcome after hysterectomy found a significant decline of pre- and postoperative psychiatric morbidity from 1975 to 1990 in women undergoing hysterectomy which was not associated with demographic and social characteristics, previous psychiatric history, family psychiatric history, the nature of the women’s menstrual complaints and the women’s understanding and expectations of the intervention (76). These results

may reflect that in the past patients with emotional symptoms preferentially were referred to hysterectomy as well as the reduced tendency of health care professionals to treat psychiatric symptoms with this operation (65,71).

Although a postoperative episode of depression is seen in about 10% of patients there is little evidence that hysterectomy without oophorectomy causes depression (71). The so called post-hysterectomy syndrome is postulated as the combination of somatic and psychological disorders after a hysterectomy. Its development could be explained by somatic long-term adverse effects due to the operation, a discrepancy of the patient's wishes and expectations in regard to her health status and life after the operation and the actual outcome, reaction of the social environment about persisting ailment and helplessness and changed behavior of the physician since causal treatment is not possible and patients complain for ongoing and new symptoms. All these factors could lead to the observed depressive reactions since these patients feel themselves to be left alone (5).

Since women with gynecological problems, women undergoing hysterectomy and women who might be bothered by long-term adverse effects of the ablation of the uterus are vulnerable in an awkward position (5) negative messages given by physicians (17) might have an adverse impact on their psychological and somatic situation and the outcome of the treatment (5).

Presurgical depression and anxiety probably increases the risk for poor psychological outcome (65,71) as may young age (<40 years) at the time of hysterectomy (77). The impact of hysterectomy concerning body image perception, femininity and self-perception received little empirical research attention and results are ambiguous, some suggesting impaired body image especially after abdominal hysterectomy (71).

In the majority of patients hysterectomy improves quality of life and life satisfaction (42,65,78,79). A survey in Germany asked women who underwent hysterectomy about their satisfaction with the operation results, 67% of women indicated to be very satisfied, 24% rather satisfied and 4% were unsatisfied with the outcome. As reasons for their satisfaction women named successful operation, good overall treatment in the hospital, freedom from symptoms which have led to the operation and better quality of life after hysterectomy. Women who were rather satisfied reported next to the relief of symptoms, complications and long-term

adverse effects after the procedure, doubts about their decision and that they expected a greater amelioration of their complaints. The 4% of women who stated to be unsatisfied with the result of their hysterectomy reported bad performed procedures, complications during operation, lingering symptoms, insufficient information and education about the procedure and long-term adverse effects. (80)

2.3.6 Alternatives to hysterectomy for common benign conditions of the uterus

For several benign conditions of the uterus often treated with hysterectomy there are other, less invasive treatment options. These alternatives are more or less effective.

2.3.6.1 Uterine leiomyoma

Asymptomatic fibroids can be followed expectantly and do not require treatment. For symptomatic leiomyomas several treatment options are available.

Medical treatment options: For medical treatment contraceptive steroids such as estrogen and progestin combinations and progestin alone are widely used to ameliorate bleeding abnormalities due to myomas without stimulating further growth of the tumor but with no evidence for effect on uterine size and tumor reduction. Nonsteroidal anti-inflammatory drugs are an effective treatment for dysmenorrhea caused by leiomyomas. The levonorgestrel intrauterine system (Mirena®) might be effective for dysfunctional uterine bleeding in women with fibroids. Gonadotropin-releasing hormone agonists lead to a reduction of leiomyoma, but side effects such as pseudomenopause and reduction of bone density limit their use. Aromatase inhibitors may have an effect but little data exists for the treatment of uterine leiomyomas with these drugs. Progesterone modulators have a positive effect on leiomyoma symptoms and volume, amenorrhoea is a common side effect but bone density is stable.

Surgical options: Conservative surgical procedures to treat symptomatic leiomyoma are abdominal, laparoscopic or hysteroscopic myomectomy. Abdominal myomectomy is a safe and effective treatment option; laparoscopic

myomectomy minimizes the size of the incision and results in a quicker recovery but requires advanced laparoscopic skills; hysteroscopic myomectomy is suitable for submucous fibroids which cause dysfunctional uterine bleeding.

Uterine artery embolization is performed by interventional radiologists. Via a transcutaneous femoral artery approach the uterine arteries are embolized which leads to a devascularisation and involution of the uterine leimyoma. In comparison to hysterectomy uterine artery embolization has similar complication rates, compared to myomectomy it has higher readmission and reintervention rates. It is considered as a safe and effective option for appropriate selected women but entails radiation exposure and requires considerable pain relief post-procedure.

Magnetic resonance imaging-guided focused ultrasound surgery is a new noninvasive approach to treat uterine leiomyomas. High-intensity ultrasound waves directed into the focal volume of a leiomyoma are used to obtain protein denaturation, irreversible cell damage and coagulative necrosis in the tumor and therefore reduce symptoms and leiomyma size. Short-term studies show safety and efficacy of the method but long-term outcomes are not yet assessed.

All uterus-preserving treatment options bear the risk of persistence or recurrence of leiomyomas and symptoms and because simple, inexpensive and safe long-term medical treatments are lacking surgery remains the treatment of choice for symptomatic fibroids (15).

2.3.6.2 Dysfunctional uterine bleeding

For dysfunctional uterine bleeding several medical treatments are available. The levonorgestrel intrauterine system (Mirena® by Bayer AG/ Schering AG) is an intrauterine device that is inserted in the uterus for up to five years and releases low dose of a gestational agent which suppresses endometrial activity and thus reduces menstrual blood loss and provides contraception. Although it reduces bleeding less than surgical methods and adverse side effects are reported, quality of life and satisfaction outcomes are comparable to those of surgery. Anti-fibrinolytic drugs reduce bleeding by inhibiting fibrinolysis, are only taken during menstruation and usually well tolerated. Nonsteroidal anti-inflammatory drugs such as mefenamic acid and naproxen reduce blood loss during menstruation and relieve cramps by inhibiting the production of prostaglandines. Progestogens suppress endometrial growth and activity but are not well tolerated by many

women and have long-term adverse effects on bone density. Combined oral contraceptives reduce menstrual blood loss and are also widely used to treat dysfunctional uterine bleeding. Danazol, a synthetic hormone, is highly effective in reducing blood loss but is no longer used because of androgenic side effects (16).

Endometrial ablation is a surgical treatment option which preserves the uterus. Hysteroscopic techniques use electrosurgical or laser tools, non-hysteroscopic second generation techniques use controlled application of heat, cold, microwave or other forms of energy to destroy the endometrium and the underlying basal glands. These surgical techniques have fewer post-operative complications but higher retreatment rates than hysterectomy, satisfaction rates are comparable (16).

2.3.6.3 Pelvic organ prolapse

Pelvic organ prolapse should only be treated if symptomatic. Observation is appropriate when medically safe and preferred by the patient and changes of lifestyle, weight reduction and physical therapy (pelvic floor exercises) can be helpful. Pelvic floor muscle training may reduce symptoms and prevent deterioration. Pessaries may improve protrusion symptoms. In women with severe urogenital prolapse who prefer conservative management, local estrogens are used to prevent or treat vaginal epithelial ulceration. (81)

Symptomatic urogenital prolapse is generally treated surgically. A wide variety of surgical techniques exist. Vaginal, abdominal or laparoscopic approaches are used. Next to colporrhaphy being the most common, various other techniques are performed with or without hysterectomy (82).

2.3.6.4 Endometriosis

Treatment of endometriosis follows individual concepts, many medical options such as oral contraceptives, gestagens, gonadotropin-releasing hormone agonists, gonadotropin-releasing hormone antagonists, danazol, aromatase inhibitors and COX-2 inhibitors are in use (83). Surgery is frequently performed. Treatment, medical or surgical, is individualized according to findings, symptoms and the patient’s situation.

3 Methods

The aim of the present study was to ascertain hysterectomy rates in Austria and analyze these rates over time. To ascertain annual hysterectomy rates in Austria we used data from the *Österreichische Bundesinstitut für Gesundheitswesen* (ÖBIG). These data derive from the Austrian LKF system (leistungsorientierte Krankenanstaltenfinanzierung), which is used by all public hospitals and covers about 90% of all inpatient treatments (it does not include private hospitals). The LKF is a documentation system in use since 1997 and is based on the ICD 10 coding system for diagnoses and MEL codes (Medizinische Einzelleistung) for procedures (32). We also attempted to ascertain hysterectomy rates before 1997 but these data are not reliable because there was no consistent collection of data prior to introduction of the LKF system in 1997.

We looked to identify all inpatient stays in hospitals using the LKF system with the intervention “HYSTERECTOMY” (MEL codes 3711, 3712, 3751, 3752, 3753, 3754, 3761, 3762, 3766; Table 1) from 1997 to 2008. Operations with the MEL-codes 3711, 3712, 3752, 3761, 3762 and 3766 (Table 1) are radical procedures performed for malignant indications, thus we deduced that the majority of interventions with MEL codes 3751, 3753 and 3754 (Table 1) were carried out for benign indications.

Hysterectomy rates were calculated as the number of inpatient stays with the intervention “HYSTERECTOMY” per 100,000 women all ages (foreign guest-patients excluded). To calculate the hysterectomy rate for benign indications we used the data registered under MEL codes 3751, 3753 and 3754. Age-adjusted rates were calculated referred to the mean European population data derived from *Statistik Austria.* Calculations were performed using QGIS-Software.

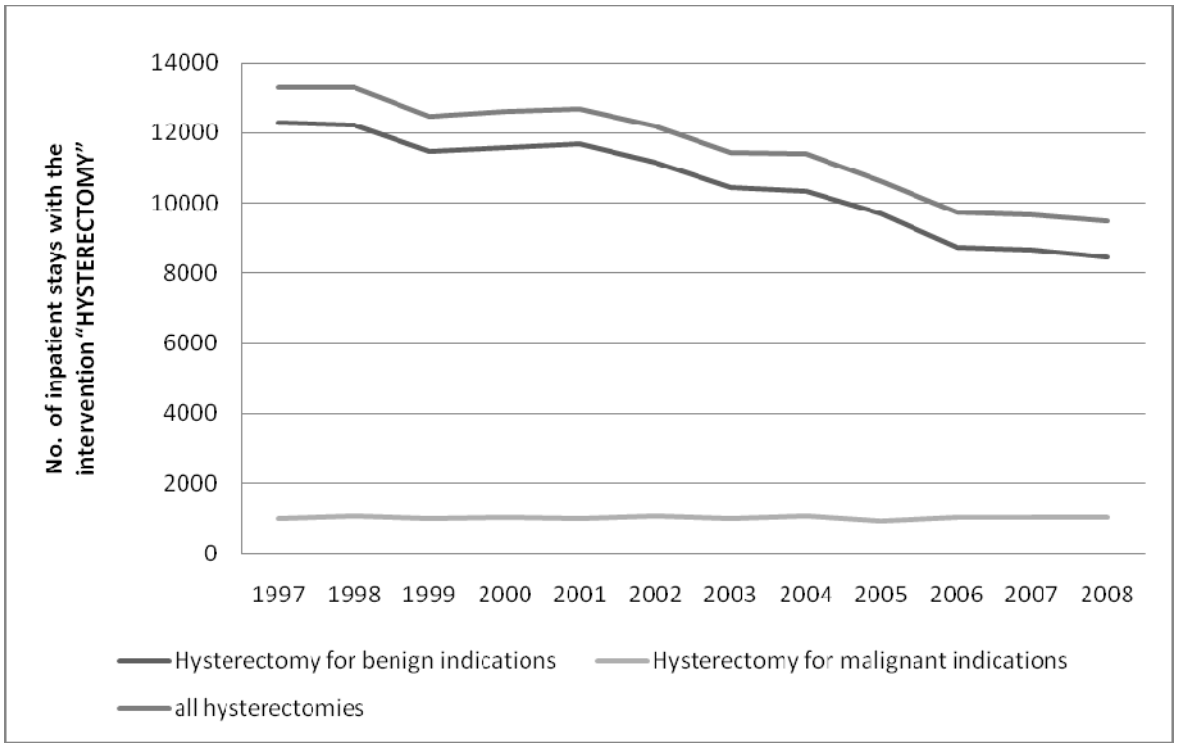
Table 1 Classification of hysterectomy according to the Austrian MEL code system

Surgical intervention	MEL-code
Radical procedure for malignant tumor of the ovaries (with resection of the pelvic lymph nodes, hysterectomy, bilateral salpingo-oophorectomy, resection of adjacent organs and/or tissue, omentectomy)	3711
Radical procedure for malignant tumor of the ovaries (with resection of the pelvic lymph nodes, hysterectomy and bilateral salpingo-oophorectomy, resection of adjacent organs and/ or tissue, omentectomy and resection of paraaortic lymph nodes	3712
Vaginal or abdominal hysterectomy under difficult circumstances (recurrent intervention, tumor of the uterus >15 cm, morcellation, salpingo-oophorectomy)	3751
Total abdominal hysterectomy with pelvic lymphadenectomy	3752
Vaginal or abdominal hysterectomy without salpingo-oophorectomy	3753
Hysterectomy with anterior/ posterior colporrhaphy	3754
Radical abdominal hysterectomy (Wertheim-Latzko) with complete excision of the pelvic lymph nodes	3761
Radical abdominal hysterectomy (Wertheim-Latzko) with complete excision of the paraaortic lymph nodes	3762
Radical vaginal hysterectomy (Schauta-Amreich)	3766

4 Results

The hysterectomy trends for benign and malignant indications between 1997 and 2008 are shown in Figure 7. Overall hysterectomy rates declined steadily from 13,286 overall hysterectomies in 1997 to 9,488 in 2008.

Figure 7 Inpatient stays with the intervention “HYSTERECTOMY” in Austria from 1997 to 2008



In 1997 a total of 12,283 hysterectomies were performed for benign indications in Austrian public hospitals (Table 2). In 2008 only 8,470 were carried out for benign reasons. Benign indications accounted for 92% (1997) and 89% (2008) respectively of all hysterectomies. This amounts to a decrease of hysterectomy for benign indications of 31% over 11 years. From 1997 to 2008 there has been a decline of the overall number of hysterectomies of 29% while the number of hysterectomies performed for malignant indications has remained relatively stable (Fig. 7).

The age-adjusted overall rate decreased from 308 hysterectomies per 100,000 women (all ages) in 1997 to 191 per 100,000 women (all ages) in 2008 (Fig. 8). In 2008 the age-adjusted hysterectomy rate for benign indications

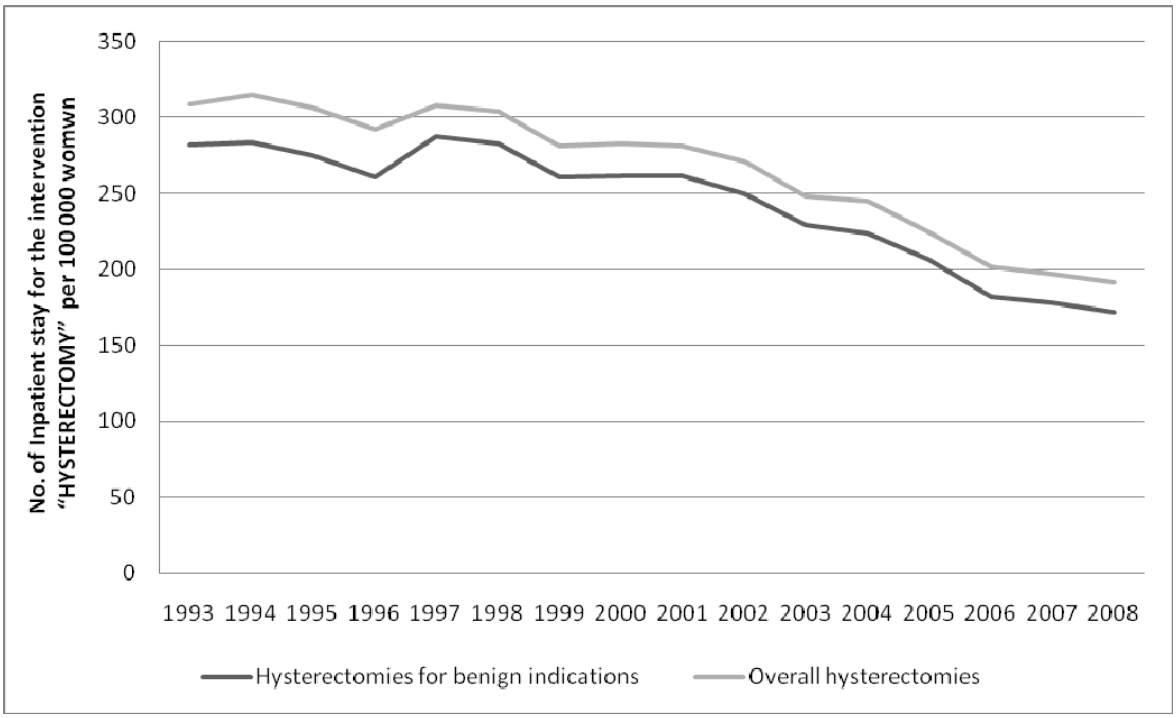
accounted for 172 per 100,000 women, 115 hysterectomies less per year per 100,000 women than in 1997.

Table 2 Change in frequency of the intervention ”HYSTERECTOMY” in Austria from 1997 to 2008

	No. of inpatient stays for the intervention Hysterectomy in 1997	No. of inpatient stays for the intervention Hysterectomy in 2001	Change from 1997 to 2001	No. of inpatient stays for the intervention Hysterectomy in 2005	Change from 2001 to 2005	No. of inpatient stays for the intervention Hysterectomy in 2008	Change from 2005 to 2008	**Change from 1997 to 2008**
Hysterectomy for benign Indications	12,283	11,703	-5%	9,716	-17%	8,470	-13%	**-31%**
Hysterectomy for malign Indications	1,003	976	-3%	920	-6%	1,018	+11%	**+1%**
All Hysterectomies	13,286	12,679	-5%	10,636	-16%	9,488	-11%	**-29%**

Data between 1993 and 1997 have to be interpreted with caution because they have no reliable quality before the implementation of the Austrian LKF system in 1997. According to this data the hysterectomy rate stayed relatively stable from 1993 to 1997 with about 300 hysterectomies per 100,000 women per year (Fig. 8).

Figure 8 Age-adjusted hysterectomy rate per 100,000 women in Austria from 1993 to 2008



5 Discussion

5.1 Trend of hysterectomy rates in Austria

We found a 31% decline in hysterectomy rates for benign indications in Austrian public hospitals over a relatively brief period of 11 years. The influences on hysterectomy rates and the possible reasons for this change are discussed in Chapter 5.3.

This study was based on data derived from the LKF system which was implemented in 1997.

5.2 International Comparison

One might think that there are robust and comparable data on the rates of one of the most common operations in women in different countries. One would be wrong. There are considerable differences in documentation of data, collection, including and excluding criteria as well as different populations used for the calculation of the rates and age-adjustment, therefore the comparison shows only approximate and imperfect comparisons.

Only four publications of hysterectomy rates of other countries allowed a direct comparison with our results: Switzerland, Finland Norway and Denmark have rates calculated per woman all ages.

Hysterectomy for benign indications in Austria can only be compared with results from Denmark (7):

Table 3. Hysterectomies for benign indications / 100,000 women (all ages) in Austria and Denmark

Country / Year	1988	1998	2008
Austria	n.a.	282	172
Denmark (7)	193	182	n.a

(n.a.= not available)

In 1998 hysterectomy for benign indications was more frequently performed in Austria than in Denmark, since than rates in Austria declined to 172/100,000

women which is a little lower than Danish rates 10 years ago (Tabble 3) but we do not know how rates in Denmark developed since then.
Overall hysterectomy rates can be compared with data from Switzerland (8), Finland (9) and Norway (10) as shown in Table 4:

Table 4. Overall hysterectomies / 100,000 women all ages in different countries

Country / year	1987	1990	1995	1997	2005	2008
Austria	n.a	n.a	n.a	308	225	191
Switzerland (8)	n.a	n.a	n.a	n.a	290	n.a
Finland (9)	340	n.a	414	n.a	n.a	n.a
Norway (10)	n.a	164	n.a	n.a	n.a	n.a

Norway has lowest rates, whereas in Finland overall hysterectomy rates increased from 340 in 1987 to 414 in 1995, which is higher than Austrian rates in 1997. In 2005 hysterectomy was performed more frequently in Switzerland than in Austria (290 versus 225 / 100,000 women).

Several publications have documented the wide variation of hysterectomy rates amongst countries, but unfortunately their results cannot be directly compared with our data. The following itemization shows the large variations and the difficulty to compare these results:

Hysterectomy rate for benign indications:
Sweden 2003: 210 /100,000 person years (calculated for all women older than 18 years) (11).

Overall Hysterectomy rates:
USA 2000: 540 / 100,000 women older than 15 years (12),
USA 2004: 510 / 100,000 women older than 15 years (12),
Western Australia 2003: 480 / 100,000 women aged 20 to 85 years (13),
New Zealand 1992: 365 / 100,000 women aged 15 to 54 years (14)

Even though comparable data of most countries are lacking, the data shown in Tables 3 and 4 suggest that the overall hysterectomy rate in Austria, with 191/100,000 women in 2008, is not higher than that of other countries.

5.2.1 Variation and trends of hysterectomy rates

The studies cited above show strong variations of hysterectomy rates among different countries. Hysterectomy rates appear to be markedly higher in the USA, Western Australia and New Zealand than in European countries (7-14). The same difference can be seen in a study of the hysterectomy rate in New Zealand in 1991, were the rate was 365/100,000 women in 1991 and the comparison of rates of different countries with data of frequency of hysterectomy derived from OECD 1993 (the comparability and reliability of these data have to be seen with caution) showed highest rates in Switzerland (1986), Canada (1985), the USA (1989), Australia (1983) and New Zealand (1991) and lower rates in Japan (1980), Ireland (1989), Norway (1986), Sweden (1980), Denmark (1982) and England and Wales(1991) (14).

Trends in hysterectomy rates differ among countries as well. Hysterectomy rates decreased over time in Austria, Switzerland (8), Western Australia (13) and New Zealand (14), have remained relatively stable in Denmark (7), Sweden (11), and the USA (1,12) but increased in Finland (9).

5.2.2 Why hysterectomy rates are hard to compare

We found only four publications (7-10) which allowed a direct comparison with our results. The OECD database could only provide hysterectomy rates for the vaginal route with no possibility to deduce the actual rate of overall hysterectomies or the rate of hysterectomies for benign indications. The OECD database provides data of vaginal hysterectomy in Austria from 1997 to 2005, the rate for vaginal hysterectomy accounted 111 / 100,000 females (in-patient) (84) in 1997, in relation to the Austrian rate of hysterectomy for benign indications in 1997 (287 / 100,000 women) we deduced from the LKF, it can be estimated, that about 39% of hysterectomies were performed through the vaginal route already in 1997 and 40% in 2005, which is high compared internationally (11,12,85) and equates to current recommendations (40).

It would have been of special interest to compare Austrian hysterectomy rates with those of Germany, but comparable data in our study period were not available. The epidemiology of hysterectomy in Germany was indicated with 18.1 /

10,000 residents (female?) in Western Germany in the period between 1995 to 1997 (5) others quote it to be between 350 and 181 / 100,000 female residents in Western Germany (80) and a decrease of 25% of the frequency of hysterectomy was observed from 1987 to 1994 by the "*Kassenärztliche Vereinigung*" (5). A survey of the "*Bremer Institut für Präventionsforschung und Sozialmedizin*" in 2000 found that every fourth women aged 40 to 70 years in Bremen has had hysterectomy (80); these results cannot be compared with our data. 88,700 hysterectomies were documented in Germany in 2002 and numbers of hysterectomies for benign indications in patients younger than 35 years are stated to be too high by the "*Robert Koch Institut"* in 2007 (86). The "*Bundesinstitut für Qualität und Patientensicherheit"* of Germany published the number of 147,351 hysterectomies for the year 2008 on its homepage (87).

Data on hysterectomy rates in France are very inconsistent. In some literature hysterectomy rate in France is cited to be 90 / 100,000 women in the 1990s (18,80) and in 2005 (88) others report that in a survey only 2.4% of French women underwent hysterectomy (5) but I could not retrace the references. A French survey found a hysterectomy rate of 29.8 / 10,000 women aged over 15 years in 1992 in France and French authors stated in 2001 that it is difficult to ascertain the exact number of hysterectomies performed in France each year (89). According to the "*Collège National des Gynécologues et Obstétriciens Francais"* about 70,000 hysterectomies are performed annually in France and compared to other European countries France has the lowest rate (France 14%, Italy 15%, UK 32%, Germany 35% Netherlands 46%) (90) but they did not publish the actual French rates and did not give references to support these numbers.

Also for other countries only overall numbers but no rates could be found, or the original publications and source of data were not available.

5.3 Determinants of hysterectomy rates and likelihood to undergo hysterectomy

The large variations of hysterectomy rates between countries with similar demographics imply factors other than prevalence of leiomyoma, menorrhagia and other benign uterine conditions to influence the rates of hysterectomy.

5.3.1 Use of other treatment options and clinical practice patterns

The introduction and use of less invasive treatment options for benign conditions of the uterus probably play a role in the reduction of hysterectomy rates.

Hysterectomy rates for leiomyoma have declined in northern California due to uterine conserving procedures including endometrial ablation and uterine artery embolization (91). A study on hysterectomy rates for menorrhagia in England showed a decline of 36% from 1989-90 to 2002-3 which cannot be due to endometrial ablation alone since the number of operations dropped as well. The start of the decrease of hysterectomies coincides with the introduction of the levonorgestrel intrauterine system Mirena® as a contraceptive method in 1995 although it was licensed for treating menorrhagia only in 2001. This study suggests that also in secondary care hysterectomy is no longer the usual management for menorrhagia (92).

The introduction of Mirena® is likely to have had an important influence on hysterectomy rate in Austria as well as the use of other treatment options like endometrial ablation and uterine artery embolization.

In contrast, a retrospective study at a university hospital in the Netherlands researched the impact of alternative treatments for abnormal uterine bleeding on hysterectomy rates and found no decline of the hysterectomy rate between 1995 and 2004. However, they found increased numbers of hysteroscopic surgeries, an increased use of levonorgestrel intrauterine systems and a significant decrease of hysterectomy used as initial treatment. The number of women receiving endometrial ablation declined and it seemed that the threshold for intervention has lowered since patients who received alternative treatments were younger than patients who were treated with hysterectomy as initial therapy. Therefore the

introduction and use of alternative treatments showed no impact on hysterectomy rates in this study (93).

These divergent results probably reflect differences in attitude and clinical practice among different countries concerning hysterectomy for benign conditions.

Two studies comparing the rate, type and costs of invasive interventions for uterine leiomyomas and of pelvic organ prolapse surgery in Germany, France and England show significant variations of practice patterns: while in France and England 60% and 64% of the admissions for uterine leiomyoma interventions included hysterectomy, in 85% of admissions for uterine leiomyoma interventions in Germany a hysterectomy was performed, this percentage is even higher than that of the USA (75%) (85). Hospital admissions for prolapse surgery show also different practice patterns: while the percentage of hysterectomies with POP as the primary indication was similar with 20% in Germany, 21% in France and highest in England with 25% the percentage of POP admissions that included a hysterectomy was highest in Germany with 57%, in France it was 45% and in England 41% and most hospital admissions in France (73%) and in England (94%) included a colporrhaphy (94). These results probably reflect differences in prevalence and severity but also in treatment-seeking behaviors and treatment patterns (85,94).

Treatment variations also exist within countries. In England considerable differences in the relative use of endometrial ablation and hysterectomy was found within different regions while for other indications related to menorrhagia (adenomyosis, dysmenorrhoea, uterine fibroids or polyps) less variation was observed compared to women with only menorrhagia (29).

There is also variation in the proportion of the use of different operation routes. In England (90%) (85), Sweden (63%) (11) and the USA (68%) (12) most hysterectomies are abdominal, in western Australia in 2003 only 40% were abdominal and 45% were vaginal (13) where as in France the majority is performed through the vaginal route (58% (85) 57% (38).

There is even a wide variation in individual hysterectomy practice, as some gynecologists use nearly always the same route for apparently similar indications (37).

Differences in the percentage of the most common benign indications for hysterectomy can also be seen in these studies: uterine leiomyoma accounts for

41% in the USA, 27% in western Australia, 51% in Sweden, and 67%/ 60% in northern France; endometriosis for 18% in the USA, 12% in western Australia, 7% in Sweden and 11%/ 5% in northern France; uterine prolapse for 14% in the USA, 23% in Western Australia, 8% in Sweden and was not mentioned in the study of northern France were as in the USA dysfunctional uterine bleeding/menstrual disorders were not listed which accounted in Sweden for 13%, in western Australia for 21%, and in northern France for 14%/ 27% of hysterectomies for benign indications (11-13,89).

The indications for hysterectomy showed no change in the USA (12), in Sweden hysterectomy for POP increased fourfold (11) and in England a 64% reduction of hysterectomies for menorrhagia was observed from 1989 to 2002-3 (92).

More critical use of hormone replacement therapy especially in women who have not undergone a hysterectomy, might also have influenced hysterectomy rates since gynecologists observe a decrease of the incidence of endometrial hyperplasia with atypia.

A Canadian study of hysterectomy rates and indications in the province of Ontario showed substantial variations of rates for different indication for hysterectomy among regions concerning more discretionary indications such as menstrual hemorrhage, uterine prolapse and endometriosis and smaller variations for clear- cut diagnosis like leiomyoma (27).

5.3.2 Determinants of the health care system

The differences in the health care organisation and insuring systems among countries may contribute to variation of hysterectomy rates. There are claims that these variations seem to be better explained by surgical bed density or insurance and payment systems than by sociodemographic characteristics and morbidity (31).

In a Canadian study on hysterectomy rates variations across small areas and across physicians practices no relationship between hysterectomy rates hospital beds and physician supply was found as well as few barriers to health care access (26). In contrast, an American study showed that physicians who work

in areas with lower density of gynecologists perform higher rates of hysterectomies and supports the assumption that higher numbers of surgeons are not necessarily associated with increased rates of surgery (25).

Hysterectomy rates are higher in rural and remote areas (27,13) and lowest in urban areas with teaching hospitals (27).

Insurance and payment might play a role in variation of hysterectomy rates. Especially the significantly higher rates in the USA compared to European countries might be explained by fee-for-service based systems. Also women themselves might rather decide for a definitive treatment, if they do not want to preserve fertility. This saves future problems and costs, because they simply cannot afford to try conservative treatment options where reintervention might be necessary. In countries where the public healthcare insurance covers uterus conserving treatment options as well as hysterectomy patients are free to decide for a suitable treatment. In Switzerland the prevalence of hysterectomy in patients with general insurance was 12.2% and that among privately insured patients was 18.1% (30) while in Western Australia having only public health insurance but also being treated in a private hospital increased the odds of having a hysterectomy (13). In North Carolina insurance and reimbursement were not found to be predictive for hysterectomy rates (25).

Open access to specialists and referral patterns could also be a health-care-system-related factor influencing hysterectomy rates (26).

Results from other countries with other insurance systems cannot be applied to explain the relation between the insurance system and the frequency of hysterectomy in Austria, even though physicians earn more money with privately insured patients it is doubtable if private insurance status influences the overall hysterectomy rate. We have no data on patients operated in private hospitals in Austria.

5.3.3 Do physician factors influence hysterectomy rates?

Physician factors such as sex, age, practice style and clinical believes are poorly researched and might influence practice patterns and respectively hysterectomy rates.

In Switzerland a study found that female gynecologists performed only about half as many hysterectomies (median yearly number 18) as their male colleges (median yearly number 34) (30). The influence of the sex of the general practitioner on the management of menorrhagia was studied in the Oxford Regional Health Authority area, women general practitioners were less likely to refer their patients to gynecologists, fewer of their patients underwent surgery and their patients reported a higher participation in treatment decisions but patients of male general practitioners were more satisfied with the received therapy; these differences were not statistically significant and similarities in practice styles appeared more striking (95). In North Carolina Bickell et al. found that more hysterectomies were performed by male gynecologists but year of residency graduation seemed to be a confounding factor for this result and no statistically significant difference between female and male gynecologists was found concerning clinical belief such as the contribution of the uterus to sexual function or gender identification, and they did not differ in appropriateness ratings. The increasing number of female gynecologists might influence existing norms but they might as well adopt their viewpoints as the majority of gynecologists trained at this time period were men (25).

The only physician factor which remained associated with hysterectomy rates in a multivariable model was the year of residency graduation. Recently trained gynecologists use hysterectomy at lower rates, are less likely to believe that the uterus does not contribute to sexual function and that hysterectomy is generally more efficacious than medical treatment. As Bickell et al. found higher rates of hysterectomy are carried out by physicians with higher percentages of patients with abnormal bleeding or cancer, this finding may reflect the increased need for hysterectomy but also a lower threshold to perform surgery among physicians exposed to more severe symptoms and pathology (25).

Roos et al. tried to assess physicians practice styles with impact on hysterectomy rates and on the probability for a patient to undergo hysterectomy identified “hysterectomy-prone primary care physicians” in calculating the

observed/expected ratio of hysterectomy of physician's primary practice. Physicians with rates of 2.0 or higher were considered as "hysterectomy-prone". The results of this study suggested, that "hysterectomy-prone" physicians are most likely to be gynecologists or general practitioners and are more likely to perform the intervention themselves. Such physicians tend to interpret and diagnose the conditions of their patients to be of gynecologic origin and are more likely to advise surgical intervention. Since residents of areas with high hysterectomy rates are more likely to have "hysterectomy-prone" physicians as primary physicians in this survey, the authors conclude that practice styles might have an influence on hysterectomy rates, especially on the variations across small areas (26).

The lack of association of appropriateness ratings of hysterectomy and hysterectomy rates provides also support for the assumption that not only appropriateness for a procedure but also particular physician factors influence practice (25).

5.3.4 Patient-related factors

The impact of socioeconomic status on probability to undergo hysterectomy is well explored. Several studies confirm the inverse relation between socioeconomic position and hysterectomy rate. Woman with higher socioeconomic status, higher education, higher employment status, greater family network and higher social class of the partner are less likely to undergo hysterectomy (13,96-100). Woman with a high school diploma were about 30% less at risk to undergo hysterectomy than women without high school diploma (97). The association of higher education with a lower rate of hysterectomy is not due to ability, but to better opportunities for higher status employment and its health-related benefits (98). Whether higher education also goes along with an increased tendency to seek a second opinion and or a preference to preserve the uterus was not assessed in these studies.

Patient demand and doctor shopping are also factors related to the risk undergoing a hysterectomy as women who are less willing to tolerate symptoms have more physician contact and higher surgery rates (26). Women in their middle years face a multitude of social and psychological challenges which might contribute to treatment seeking-behavior and bearing of symptoms.

Psychotherapists observe higher rates of gynecological operations in women who experienced rape or sexual abuse (17).

Parity shows a strong association to hysterectomy rates. Hysterectomy for fibroids fell with parity and hysterectomy for menstrual disorders had an inverse relation with parity in a British study (100). An Italian study reported an increased performance of hysterectomy in nulliparous women (101) and a study in New Zealand found that the higher the parity the greater the risk of having hysterectomy and that pregnancy loss was also associated with higher hysterectomy rates (97).

There is an expected relation between age and hysterectomy. Most hysterectomies are performed in the age group of 36 to 55 years (7). In Finland almost half of the increased hysterectomy rate from 1987 to 1992 was attributed to the changing age structure of the population (9).

Obesity is also a patient related factor affecting hysterectomy rates. Women with a higher BMI are more likely to undergo hysterectomy (101) and obesity aggravates symptoms of pelvic organ prolapse and increases the risk of symptomatic leimyoma and endometrial polyps (102).

Several studies found ethnicity to be related with variation in hysterectomy rates (13,26,97) this might be due to culture, religion and believes but could also be influenced by health care accession socioeconomic variables and educational status. In the Canadian province of Manitoba residents of areas with high hysterectomy rates are more likely to be of French, Italian or Polish ethnicity, these groups are largely Catholic and since it has been suggested, that for traditional Catholic women, hysterectomy performed for gynecological problems might be the only acceptable method of contraception/sterilization, these findings support that theory (26). Also in Germany higher hysterectomy rates were found in mainly Catholic areas (17). In New Zealand the percentage of women who have had a hysterectomy was higher among Christian women (Catholic, Anglican, Presbyterian and Methodist) and lower among women with other or without religion (97). In the same study a significant lower hysterectomy rate was observed among Maori women even though Maori have disproportionately lower socioeconomic position (97). In western Australia there was a similar observation with a overall hysterectomy rate of indigenous women only half of the rate of nonindigenous women, a lower proportion of hysterectomies for menstrual

disorders, endometriosis and genital prolapse but higher rates of hysterectomy for malignant indications (13).

5.4 "Too many hysterectomies!?"

The considerable international variation of hysterectomy rates raises the question whether hysterectomy is performed too frequently and if recommendations for hysterectomy are appropriate (28). The discussion about the appropriateness of indications and rates of hysterectomy among physicians started already 30 years ago (17,103) self-help groups were formed by women who reported adverse long-term effects (18,19), and the topic was picked up by the media with ongoing contributions in newspapers and television.

5.4.1 Hysterectomy in the media

Information about hysterectomy propagated by public media has an impact on rates. A Swiss study published in 1988 assessed hysterectomy rates in the Swiss Canton Ticino from 1977 to 1986 and induced a public information campaign about rates of and indications for hysterectomy in the mass media in 1984. Ticino is the only Swiss Canton with Italian as official language, therefore information reached only residents of this area and a comparison of hysterectomy rates was made with those of the German speaking Canton Bern were no information about hysterectomy was provided to the public. In the following year the overall hysterectomy rate dropped by 25.8% in Ticino, whereas in Bern it increased by 1%, the decline began 2 months after the start of the information campaign with a greater reduction in non-teaching hospitals. The authors suggested that information about rates of and the need for hysterectomy given by the mass media to the general population can change professional practice (31).

In Germany hysterectomy practice, indication and long term effects were widely discussed in public media (20,21) and books about the sense and

nonsense of hysterectomy were published (17). The impact on hysterectomy rates and changes in clinical practice were not assessed and hysterectomy rates in Germany are unfortunately hard to pin down.

In the USA newspaper articles (22) books (103) and information campaigns and discussions in the internet (19,103) seem to have no significant effect on hysterectomy rates since they are stable since 1990 (1,12).

Also in Austria hysterectomy has been subject of media attentions. An episode of the talk-show "*Help TV*" was broadcasted on 15. 3. 2006 with the title "Gebärmutterentfernung" (removal of the uterus) (23). Participants in the discussion used terms like "der Eingriff" (the intervention), "Totaloperation" (total operation) and "diese Operation" (this operation) without defining which operation has been performed. Two women were interviewed. Both of them actually underwent also an oophorectomy, one for cancer the other one for severe endometriosis, both suffering from long-term adverse effect due to hormone deficits and side effects of hormone-replacement therapy. Indications for hysterectomy were only discussed by mentioning malignant and preventive indications sparing out all benign indications which account for 89% of all hysterectomies performed in Austria. Severe long-term adverse effects were widely discussed but positive outcomes like increased quality of life in the majority of women after hysterectomy were not mentioned (42,65,78-80). For alternative treatment options only uterine artery embolization was mentioned by the only physician participating in the discussion, a radiologist. This broadcast gave a distorted image of hysterectomy. It mixed different operations of the female genital organs leaving an agitating impression which might alienate women suffering from conditions where hysterectomy is indicated and discourage them from seeking professional help. It is important that patients who suffer from adverse effects of operations or inappropriate treatment talk in public about their experience. It is especially courageous when problems concerning the genital organs are addressed. But the subject should be clearly defined and facts must be considered.

Confusion about gynecological interventions is also seen in a 2009 released book about corruption in Austrian medicine (88). The author accuses physicians of performing hysterectomy to save hospital beds; terms like "radikale Eingriffe" (radical interventions) and "Radikaloperation" are used for hysterectomy in general

and no distinction is made between hysterectomy and oophorectomy (description and definition of hysterectomy see above). Together with a very negative report of a woman who underwent oophorectomy and then developed hormone deficiency symptoms and has psychological problems, the author draws the picture of a cruel system where women are operated by gynecologists without medical reason (88).

The same author cites low hysterectomy rates in France (90/ 100,000 in 2007) and Norway (130 / 100,000) (88) but does not reference these numbers. I found no publications in French or international literature where these rates were mentioned.

If hysterectomy is widely used to save hospital beds, why did the rate drop dramatically in the last 11 years and why is Austria among the countries with a low hysterectomy rate? The demand that Austrian physicians should follow international standards brings up the question which standards when there are no data of most countries concerning hysterectomy rates, guidelines in Europe are in development only now, and it is questionable if guidelines from the American College of Obstetrics and Gynecology could be applied in Austria when the hysterectomy rate in the USA is more than twice as high (1,12) as in Austria .

There seems to be very little information about hysterectomy in the general population although many women are concerned. Hysterectomy still seems to be rather a taboo issue (17). Insufficient information given by the physicians about hysterectomy or other gynecological interventions is a constant claim of patients who are dissatisfied and self help groups. (17,18,23). Few organizations outside the medical system provide reliable information without distorting facts (104).

The internet is a medium where women can seek information about hysterectomy. Many websites (18,19,103-113) provide more or less reliable information. The need for information about hysterectomy of women confronted with the decision to undergo the procedure or facing the intervention and especially the need for interexchange with women who have had the operation is reflected in a multitude of forum conversations (111-113) in the internet. Women seek information about hysterectomy in general, about risks and the pain connected with the operation, how they will feel after the procedure and how long it will take to recover. They are especially interested in the experiences of other women. There are surprisingly few questions about alternatives to hysterectomy, long term-effects and effects on sexuality. Answers are mainly from women who

have had hysterectomy, usually for fibroids and dysfunctional uterine bleeding. The majority of women after hysterectomy appear satisfied with the operation and the outcome and only few report complications and adverse effects. They encourage and comfort the women who are facing the procedure and often advise them to address their treating physician with their concerns. Some women request hysterectomy for contraception, or to avoid menstruation but the majority of answers agree that hysterectomy is inappropriate if there is no medical indication. These internet discussions reflect the somatic and psychological stress of women with gynecological problems and also the relief when symptoms have disappeared and they can get on with their lives. However, only a small part of women with hysterectomy participate in internet discussion forums and therefore this media gives only a limited insight and may not be representative of the total cohort of women undergoing hysterectomy.

In Austria it is unlikely that discussions and reports in the public media contributed to the decline of hysterectomy rates as they did in Switzerland. There was no organized professional campaign addressing the subject, but the need for reliable and empathetic information for women who are concerned as well as for the general population is apparent.

5.4.2 Is there an appropriate hysterectomy rate?

The question of an “appropriate” hysterectomy rate cannot be answered easily because many different factors (see Chapter 5.3) next to demographics and morbidity influence the incidence of this frequent procedure. Already in 1988 the issue of hysterectomy was widely discussed and the President of the American College of Obstetricians and Gynecologists stated that “it is not whether there are too many or too few hysterectomies, it is, is it indicated?” (24).

The great differences of hysterectomy rates (7-14) and practice patterns (11-13,85,89,94) and the clinical uncertainty points out the importance and necessity of guidelines for the treatment of benign conditions of uterus (27). With the availability of less invasive treatment options for many benign conditions of the uterus (15,16,82,83) hysterectomy is often not discussed as first-line therapy

(28,92,104). But hysterectomy remains an option if conservative treatment is not effective, if the patient requests a definitive solution and in patients with multiple indications (15).

Since benign conditions of the uterus are relative indications for hysterectomy and alternatives are available, informed consent entails a shared decision-making process. Shared decision making is appropriate in situations of uncertainty in which more than one clinically reasonable treatment option exist (114) and patients preference should be considered in clinical practice guidelines (25).

6 Conclusion

Hysterectomy rates for benign indications in Austria declined by 31% between 1997 and 2008. Austria ranks among countries with low hysterectomy rates (see Chapter 5.2). This decrease is likely to be due to multiple factors: the development of uterus preserving options (hormonal treatments, particularly the levonorgestrel releasing intrauterine system Mirena® as well as endometrial ablation or uterine artery embolization) might have a major impact on hysterectomy rates and go along with a change of clinical practice patterns (91-93). A change in attitudes of physicians and patients concerning the female genital organs and the contribution of the uterus to sexual function and gender identification (25) as well as a different treatment seeking behavior of women demanding full information and participation in the decision making process might also have contributed.

What is surprising is the discrepancy between the presence of the topic in both the lay media and professional discussions and the lack of reliable international data. Definitions and reporting rates should be standardized, so that rates in different countries can be compared.

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Education

1988- 2000	Freie Waldorfschule Graz, Austria
7.-12. 1997	Max-Stibbe School Pretoria, South Africa
2000- 2001	Bundesoberstufenrealgymnasium Hasnerplatz, Graz
2001-2002	Land- und forstwirtschaftliche Fachschule Haidegg, course for ecological domestic science and agriculture, Austria
10.2002- 7.2003	Studies of Medicine at the Medical University of Vienna, Austria
10.2003- 9.2005	Studies of Medicine at the Medical University of Graz
10.2005- 4.2006	Academy for midwifery of Styria at LKH Graz
4.2006	Resumption of the studies of Medicine at the Medical University of Graz
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Work experience

7. 2003	Practical placement in Internal Medicine, LKH Voitsberg, Austria
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6. 2006	Practical placement in Surgery, LKH Graz west, Austria
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6. 2008	Practical placement in Internal Medicine, LKH Graz west, Austria
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10. /11. 2009	Rotation in Pediatrics Univ. Kinderklinik Graz, Austria
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10. /11. 2010	Rotation in Internal Medicine, „Krankenhaus der Elisabethinen" Graz

Experiences abroad, travel

Student-exchange South Africa, Work in France 07.-09. 2004
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German (native speaker)
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