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RISK ATTITUDE AND PATIENTS' EXPERIENCE WITH TREATMENT OF ABDOMINAL AORTIC ANEURYSM AND SEVERE CLAUDICATION

Anna Letterstål

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DEPARTMENT OF MOLECULAR MEDICINE AND
SURGERY
Karolinska Institutet, Stockholm, Sweden

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To my wonderful family

ABSTRACT

The overall aim of this thesis was to investigate the effect of information on well-being after open surgical repair (OR) of abdominal aortic aneurysm (AAA) and to explore the experience of the care pathway of OR from the patients perspective as well as to describe risk attitude and preference for treatment of AAA and severe intermittent claudication (IC). The effect of information was assessed during the first week after returning to the surgical ward using a study-specific questionnaire in patients with AAA randomized to receive either additional written information (EG) or best practice (CG). The lived experience of the care pathway was investigated in patients with AAA three months after going through OR using audio taped interviews. Risk attitude and preference for treatment was evaluated in a general population sample stratified in four age groups facing a hypothetical scenario of going through OR, in patients scheduled for AAA treatment as well as in patients with severe IC before and six months after treatment using time trade off (TTO) and standard gamble (SG) questions as well as a derived TTO value. Health related quality of life and cost-effectiveness was also evaluated in patients with severe IC.

Preoperative written information did not have beneficial effects on postoperative recovery in patients with AAA. The EG reported a significantly worse psychological well-being during the first three days after returning from ICU. Otherwise there were no significant differences between the EG and CG in physical or psychological well being. The experience of the care pathway of OR describe patients' awareness of having a deadly disease, feeling no option to decline surgery and the physical and emotional impact of OR which is difficult to cope with. During the care pathway there was a need for information and dialogue not fully met by the health care staff. Not fully understanding the risk and implications with surgery resulted in being unprepared for the long recovery period. A hypothetical situation of having AAA and facing OR was tested in otherwise healthy persons showing that the oldest age group was not prepared to take a deadly risk with treatment or trade off years to live their remaining life without the risk of rupture, to the same extent as reported by the three younger age groups. Similar results were seen for the patient group.

A decreased HRQL and functional ability in patients with severe IC influences risk attitude and preference for treatment, showing that the patients were prepared to accept a considerable treatment risk and shorten their remaining life to be free from their symptoms. Clinical parameters, HRQL and walking ability improved considerably after revascularization. Revascularization could also be considered cost-effective from a hospital perspective.

In conclusion, patients with AAA seem to need better structured information and a possibility for a dialogue with the health care staff during the care pathway. The physical and emotional impact of OR has to be assessed to meet patients need and relieve symptoms. Preference for treatment should be considered individually, with special attention to the reluctance of taking a risk with OR seen in the very elderly and to patients with severe IC willing to take considerable risks with treatment.

Keywords: Abdominal aortic aneurysm; severe IC; surgery; information; health related quality of life; risk attitude; preference; QALY; content analysis; postoperative recovery

LIST OF PUBLICATIONS

This thesis comprises the following four papers, which will be referred to in the text by their Roman numerals.

- I. **Postoperative mobilization of patients with abdominal aortic aneurysm**
Letterstål A, Sandström V, Olofsson P, Forsberg C
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- II. **Patients' experience of open repair of abdominal aortic aneurysm - preoperative information, hospital care and recovery**
Letterstål A, Eldh A E, Olofsson P, Forsberg C
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- III. **Risk attitude and preferences in persons' hypothetically facing open repair of abdominal aortic aneurysm compared to patients scheduled for open repair**
Letterstål A, Olofsson P, Forsberg C
(Submitted)
- IV. **Risk attitudes and subjective measures of outcome among patients treated for severe intermittent claudication**
Letterstål A, Forsberg C, Olofsson P, Wahlberg E
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LIST OF ABBREVIATIONS

AAA	Abdominal Aortic Aneurysm
ABP	Ankle-Brachial Pressure
ABPI	Ankle-Brachial Pressure Index
ACD	Absolute Claudication Distance
CLI	Critical Limb Ischaemia
EQ-5D	EuroQoL EQ-5 D
EVAR	Endovascular Aortic Repair
HI	Health Index
HRQL	Health Related Quality of Life
IC	Intermittent Claudication
ICER	Incremental Cost-effectiveness Ratio
ICU	Intensive Care Unit
NICE	National Institute for Health and Clinical Excellence
PAD	Peripheral Arterial Disease
QALY	Quality Adjusted Life Years
QoL	Quality of Life
OR	Open Repair
SF-36	Short-Form 36
SFA	Superficial Femoral Artery
SG	Standard Gamble
SWEDVASC	Swedish Vascular registry
TTO	Time Trade-Off
VAS	Visual Analogue Scale
WIQ	Walking Impairment Questionnaire

1 INTRODUCTION

Peripheral arterial disease (PAD) includes a group of conditions related to atherosclerosis of the arteries; stenosis, occlusions, and aneurysm of the cerebral, aorta, renal, mesenteric, and extremity arteries. Two major clinical conditions within the group of PAD are abdominal aortic aneurysm (AAA) and intermittent claudication (IC). The goal with treatment for AAA is to prevent rupture and death, and for IC, primarily to relieve disabling walking impairment and to prevent a progression to limb threatening ischemia and amputation. Patients with AAA and severe IC are facing different risk-benefit scenarios.

For patients with AAA, the risk of rupture has to be valued against the risk with treatment as well as the impact on health related quality of life (HRQL). During the initial recovery period, after open surgical repair (OR), a majority of the patients have an extensive need for support and nursing care. For patients with severe IC, the burden of impaired walking has to be valued against the risk and durability of the treatment, which, for most patients, has a beneficial effect on HRQL. Before taking a decision to treat, careful considerations have to be made with regards to the patient's situation and views, and one presupposition for stating a preference for treatment is to have knowledge about the risks and complications involved, as well as the effect on HRQL.

One important factor to consider in a risk-benefit scenario for patients with AAA is aneurysm size, meaning that the risk of rupture increases with the size of the aneurysm. When these patients are diagnosed, it still happens that the condition is explained to them as a "ticking bomb". This information is, of course, worrying, and it has been reported that being diagnosed with an AAA can have a negative effect on HRQL¹⁻³. With this scenario it is easy to assume that all patients with AAA should be treated as rapidly as possible. It is however important that the risk with treatment has to be assessed against the risk of rupture alongside any other complicating diseases the patient might have⁴⁻⁷.

There are three alternatives to treat patients with AAA which include watchful waiting, open surgery (OR) or endovascular aortic repair (EVAR). EVAR and OR are both associated with morbidity, mortality, and an initial decline in HRQL, but the most negative effects are seen for patients treated with OR⁸. With this in mind, and that the majority of AAA patients are asymptomatic, the transition from getting diagnosed to successful recovery can be a difficult experience. It has been reported that 18% of patients treated with OR would not choose treatment again, knowing the recovery process⁹.

The majority of patients with severe IC have reduced mobility and physical limitations, which are significantly improved by treatment¹⁰⁻¹³. For these patients the risk-benefit scenario has to be viewed against the mortality risk of 30 to 40% within 5 years of presentation¹⁴⁻¹⁶. A common attitude among vascular surgeons has been to avoid surgery or endovascular interventions in patients with severe IC and infrainguinal obstructions. One reason for this has been the fear of complications in this type of

reconstruction, which, in the worst case scenario, could lead to further deterioration and amputation. On the other hand, the patients are often recommended physical exercise as a part of lifestyle change, in order to manage their burden of cardio-vascular disease, diabetes, hyperlipidemia and other related diseases. Avoiding surgery could result in a vicious cycle leading to further advancement of the disease, since many patients have difficulty performing the exercise recommended to enhance peripheral circulation. With this in mind, it could mean that the patients would be prepared to take the risks involved in treatment in order to regain HRQL.

Being well-informed is a prerequisite for patient participation in decisions concerning treatment and care, and the right to information and participation has been outlined in the Swedish Health and Medical Service Act ¹⁷. Information provided to patients about a risk-benefit scenario of a proposed intervention preceding an informed consent should be sufficient and easily understandable and should include the consequences for the patient for both options that is, with or without receiving the intervention ¹⁸. This requires both verbal and written information about the disease, its treatment, potential side-effects, and risk disclosure. It is important that information about risks are disclosed, but a recent study on informed consent preceding AAA repair showed that there is a difference between surgeons' opinions on the content of risk disclosure ¹⁹. The same authors have also reported that there is dissatisfaction among patients with the content of information provided prior to a decision ²⁰. The effects of written information and risk disclosure on recovery and preference for treatment in patients with AAA and severe IC are poor and more knowledge is needed to enhance patient participation.

Risk disclosure and risk attitude affects a person's preference ²¹, which is essential information in shared decision-making. Little is known about risk attitude and preference for treatment in patients with AAA and severe IC. Few studies have used direct measures to elicit risk attitude in patients with PAD, and current knowledge is limited to patients with IC ^{22,23}. Instead, multi-attribute methods, which elicit indirect risk attitude, have been used in patients with AAA ²⁴. To facilitate medical decision-making more knowledge is needed regarding risk attitude and preference in these patient groups.

Symptom severity and impact on HRQL is likely to affect patients' preference for treatment. During recent years, HRQL has more frequently been used as an outcome measure when evaluating treatment of AAA and IC. This has led to an increased knowledge on both the short- and long-term impact of different treatment regimes, but little is known about the effects of HRQL on risk attitude and preference for treatment in these patient groups. Such knowledge can give important information to enhance patient participation in the decision process. In addition, an increased understanding of the use of these methods as helpful tools to facilitate decisions between different treatment scenarios in everyday practice is also important ²⁵.

Using HRQL and clinical parameters as outcome measures gives both a subjective and objective evaluation of treatment, which is important, but there is also a need for a deeper understanding of the experience of disease and treatment. This information is obtained using qualitative methods rather than HRQL instruments. Few qualitative

studies have tried to elucidate PAD patients' experience of disease and treatment, and the majority of the studies that do are based on patients with IC and critical limb ischemia (CLI) ²⁶⁻²⁹, with only a few on patients' experience of AAA and its treatment ^{30,31}. The care pathway for patients going through OR is a difficult process affecting HRQL, and the transition can induce vulnerability that needs to be considered in order to facilitate patients' coping skills and recovery process ³²⁻³⁴. To provide both high quality information and care to facilitate patient participation in the decision process and the transition from illness to health, more knowledge is needed on AAA patients' experience of OR.

In my clinical work as a registered nurse I met patients before treatment, while working as a coordinating nurse in charge for planning surgery and admission to the vascular department, as well as post-operatively being responsible for their nursing care. During this time I met patients with severe IC telling me how much their pain and reduced mobility had affected them in daily life and how they would have preferred treatment in an earlier stage, as well as caring for patients with AAA after OR expressing that the recovery process were more difficult than they had expected. Before surgery many of the patients who previously had undergone coronary bypass surgery, thought that OR were going to be of less magnitude. These experiences awakened my interest in improving nursing care, patient education and the prerequisites for participation in clinical decision making, and this doctoral thesis is an attempt to contribute to this aim by getting a better understanding of patients' experience, risk attitudes and preference for treatment.

2 BACKGROUND

2.1 ABDOMINAL AORTIC ANEURYSM

An AAA is defined to be a permanent localized dilatation of the aorta that is at least 50% larger than the normal or expected diameter³⁵, with the infrarenal aorta being the most common site³⁶. The exact nature of the pathogenesis of AAA is not established, but traditionally it has been viewed that risk factors such as atherosclerotic disease, family history of AAA, male sex, smoking and older age contribute to the development of most aneurysms. Now current evidence also proposes that the cause of development of AAA involves several other degenerative factors^{37,38}.

Prevalence and natural history

The prevalence of AAA ranges from 1.9% to 18.5% in men and 0% to 4.2% in women depending on population and demographics³⁹⁻⁴². In a large screening study in the USA, the prevalence for AAA with an infrarenal diameter > 3.0 cm were 4.2% in an age group between 50 to 79⁴³. It has recently been shown that using the standard definition of 30mm diameter instead of ≥ 1.5 times the normal diameter underestimate the prevalence of AAA in women⁴⁴.

The natural history of AAA is to slowly enlarge over several years, and aneurysms of 4.0 to 5.5 cm enlarge with a mean rate of 0.3cm per year^{43,45}. The enlargement rate is individual, and is found to increase with aneurysm size, older age and continued smoking³⁸.

Risk of rupture

Most AAA do not give any symptoms prior to rupture. The risk of rupture increases with size, aneurysm growth rate and biomechanical factors, as well as with gender. In a review on gender differences in AAA, it was shown that women have a higher risk of rupture⁴⁶. If a rupture occurs, the overall mortality may be as high as 80 to 90%⁴⁷. To prevent early death of AAA, many countries, including Sweden, have started population based screening programs for men >65 years of age.

Diagnosis

Since AAA usually is asymptomatic, detection often occurs after palpation of the abdomen or radiologic imaging for other conditions than the aneurysm. Ultrasonography screening is another effective method of finding AAA, and thus reduces rupture related mortality. In a meta-analysis of four randomized trials it was shown that in the group of men invited to take part in the screening program 4% to 8% had an aneurysm >3 cm. It was also stated that these men had a lower rate of

AAA related mortality due to less emergency surgery⁴⁸. Except for ultrasonography, additional imaging such as computer tomography and magnetic resonance angiography are used before treatment.

Treatment and outcome

Treating AAA is a prophylactic procedure with the goal to prevent rupture. There are three different alternatives if an aneurysm has been detected: watchful waiting, open surgery (OR), or endovascular aortic repair (EVAR). The choice of treatment depends on AAA size/diameter and growth rate, anatomy and operative risk which vary considerably due to concomitant diseases. Invasive treatment is recommended when the aneurysm exceeds 5.0 cm with a lower diameter for women^{43,45,49}. This recommendation is based on the balance between risks of rupture against risk with surgery. Watchful waiting is recommended for asymptomatic aneurysm below the threshold of 5.0 cm, and these patients are included in a surveillance program with ultrasonography every 6 to 12 months⁵⁰. Intervention is considered if reaching the diameter threshold, having an aneurysm growth of >0.5 cm in that interval or having symptoms.

The morbidity and mortality rates with surgery have decreased since the first OR of AAA was performed in the 1950s, as well as with the introduction of the less invasive treatment of EVAR in the early 1990s. Recent studies have reported an average in-hospital mortality rate of 4.5% for OR and 1% for EVAR, and the 30-day mortality rate ranging between 1.2% to 7% for OR and EVAR 4.6% to 4.7%^{51,52}. There is however a considerable variation between individual patients related to their specific risk profile. In a study on the outcome for AAA repair in Sweden between 1994 and 2005 it was shown that the 30-day mortality rates for elective AAA repair were 4.1% for OR and 2.5% for EVAR. When comparing the first and second six years, the 30-day mortality rate had decreased significantly for OR from 4.7% to 3.4%, and the EVAR procedures had increased from 0.5% in 1994 to 35% in 2005. There were also an age difference seen, with the patients treated with EVAR being older than the patients treated with OR. Factors associated with 30-day mortality were age, OR, heart disease and renal impairment⁵³. The treatment of high risk and older patients with EVAR is considered to be achieved with equal survival and less morbidity compared to OR⁵⁴. Female sex has been associated with increased mortality after AAA repair as well as higher rate of death after rupture, and fewer women are treated with EVAR^{46,53}.

The long-term result for EVAR versus OR has shown an advantage for EVAR in morbidity and mortality rates. For example, EVAR treatment was associated with a lower AAA-related death at 2 and 4 years, but no difference for overall mortality was seen between the treatment alternatives^{55,56}. In a Swedish study the 5-year survival improved after repair of elective AAA during the period between 1987 and

2005, despite treating older patients with more comorbidities, and further, the relative survival, excluding 90-day mortality, was 90.3%, showing no difference between OR and EVAR ⁵⁷.

If OR is chosen, the extensive surgical treatment often requires close monitoring in the intensive care unit (ICU) for 1-2 days, depending on cardio-respiratory and haemodynamic stability as well as time of extubation. The primary goal for patient recovery in the ICU is to decrease myocardial oxygen demand by immediate rewarming, resuscitation, effective pain and hemodynamic control ^{58,59}. The length of stay in the surgical ward ranges between 5 and 10 days, with a need for extensive support during the first week. Many of these patients also need a further stay in an institutional facility ^{60,61}. In contrast, EVAR treatment usually does not require a stay at the ICU and the length of stay is significantly shorter, with a majority of the patients being discharged to their home within three days ⁸.

The most common severe complications following OR are myocardial infarction, bleeding and renal failure, but other complications, such as respiratory failure, lower limb ischaemia and graft infection can occur. Other less common complications are paralytic ileus, bowel infarction, impotence and spinal cord ischaemia. For EVAR complications such as endoleak, post-implant syndrome and graft limb thrombosis can occur. In order to assess, anticipate and identify needs or problems, and to provide expert care, the nurse has an important role in identifying these complications ^{58,62}.

No specific follow-up is recommended for OR since the graft failure rate is very low, but for EVAR the late graft problems are more common, and it has been reported that reinterventions were required for 20% of the EVAR patients compared to 6% for the OR patients ⁵⁵. Due to the complication rates EVAR patients have to be monitored with CT after 1, 6 and 12 months, as well as annually, for the rest of their lives.

Depending on surgical technique patients HRQL is affected in different ways. In a prospective study comparing OR and EVAR it was reported that HRQL were significantly impaired during the first month after surgery, but returned to baseline after six months. EVAR patients had a more rapid recovery, but at six months their HRQL were lower in all domains compared to OR patients. Neither of the treatment alternatives affected mental summary scores ⁸. Similar results have been reported in other studies ⁶³⁻⁶⁵. In a study on long-term results after AAA repair, the return to baseline levels are being sustained after 5 years, showing no differences between OR and EVAR ⁶⁶. Sexual dysfunctions after AAA repair have been reported, showing erectile dysfunction, as well as decreased sexual interest and ability up to one year after treatment ^{67,68}.

The need for support and nursing care during hospital stay are considerable after

OR, and most problems are seen with mobility, appetite, bowel function, pain and sleep as well as a decreased emotional well-being^{31,69}.

2.2 SEVERE INTERMITTENT CLAUDICATION

Intermittent claudication is localized to the lower extremities and the underlying cause is atherosclerosis in the leg arteries⁷⁰. Many patients with IC also have concomitant coronary artery disease (CAD) and/or cerebrovascular disease (CVD) because of the underlying systemic atherosclerosis⁷¹. In patients with IC the atherosclerotic process develops gradually to finally accumulate a plaque, narrowing the arterial lumen thus blocking the blood flow to the muscles in the leg/legs⁷². The symptoms depend on the reduction of the lumen diameter, blood flow, and presence of collaterals, as well as localization of the atherosclerotic lesion. The most common symptoms are pain in buttocks, thighs or calves during exercise, which disappear within 10 minutes of rest. With the more advanced form of the disease, such as critical limb ischemia CLI), the patient suffer severe pain in toes and feet when in supine position for longer periods of time, and it is common with skin ulceration and gangrene in forefoot and toes^{15,73}. To classify the severity of IC, two different classification systems have been developed: Fontaine's stages, and Rutherford's categories^{74,75}, and both are recommended for classification of clinical symptoms (Table 1).

Table. 1 Classification of severity of IC: Fontaine's stages and Rutherford's Categories

FONTAINE'S STAGES			RUTHERFORD'S CATEGORIES	
<i>Stage</i>	<i>Clinical</i>	<i>Grade</i>	<i>Category</i>	<i>Clinical</i>
I	Asymptomatic	0	0	Asymptomatic
IIa	Mild claudication	I	1	Mild claudication
IIb	Moderate – Severe claudication	I I	2 3	Moderate claudication Severe claudication
III	Ischaemic rest pain	II	4 5	Ischaemic rest pain Minor tissue loss
IV	Ulceration or gangrene	III	6	Major tissue loss

Prevalence and natural history

Intermittent claudication is often under-diagnosed as a result of the presentation of vague symptoms in the early stage, and the capability to develop collaterals⁷⁶, as well as a lack of awareness in both patients and physicians about IC and the symptoms. Studies have shown a prevalence of 4.3% to 7% of IC in the population >40 years of age in Western countries⁷⁷⁻⁸⁰. Prevalence increases with age, and it has been reported to be 14% to 29% in people older than 70 years^{81,82}. Men are more likely to have symptomatic peripheral arterial disease, but the overall prevalence in men and women are similar after the age of 70^{80,82-85}.

The progression of the disease is slow and only one fourth of patients with IC will ever deteriorate significantly and, if so, it is more common to happen during the first year after diagnosis. It has been reported that 50% of the patients with claudication were spontaneously improved and symptom free after a 5-year period⁸⁶. There are four different ways in which IC can change: it can improve or stabilize; it can worsen with or without indication and the possibility of either surgical or endovascular revascularization; or deteriorate to require an amputation. About 1% to 3% of the patients require amputation during a 5-year period.⁸⁷

More than 60% of patients with IC also have other vascular diseases such as CAD and CVD, with 24% of those having IC, CAD and CVD^{71,88,89}. The all-cause mortality rate is higher for IC patients compared to CAD and CVD⁹⁰. The mortality for IC patients is higher than in an age-matched general population. After 5, 10 and 15 years the mortality rates are 30%, 50% and 70% respectively⁸⁷.

Risk factors

Known risk factors for IC are similar to CAD and CVD. The most important risk factors are smoking, diabetes, impaired renal function, hypertension and dyslipidemia. Smokers have a 6-fold greater risk for developing IC. Other factors affecting the progression of IC are elevated biomarkers such as homocystein, C-reactive protein (CRP), lipoprotein, D-dimer and fibriogene^{73,91}.

Diagnostic test

Palpation of peripheral pulses and measuring ankle-brachial pressure (ABP) as well as treadmill test can quantify the severity of the disease¹⁵. The ABP is used to determine the ankle-brachial index (ABPI) by dividing the higher of the dorsalis pedis or posterior tibial artery pressure in each leg by the higher brachial artery pressure. The criteria for disease severity and ABPI at rest are:

≥ 0.9 Normal, 0.8-0.9 Mild, 0.5-0.79 Moderate, and ≤0.5 Severe.

In patients with diabetes or advanced renal diseases it is common to have calcified arteries giving a false high pressure. In these cases a toe pressure is performed.

If the patient is considered for treatment, additional tests such as Doppler waveform

analysis, pulse volume recording, duplex arterial ultrasound, MR, CT and angiography are performed to reveal the presence and localization of significant stenosis or occlusions, the length of lesion, as well as in- and outflow conditions ^{73,91}.

Treatment and outcome

Patients with IC should initially receive risk-factor modification including tobacco cessation, medication to lowering lipids, blood pressure and glycated haemoglobin. It is also important to give antiplatelet therapy to reduce risk of myocardial infarction, stroke, or vascular death. There are also specific drugs for IC, suggested to increase maximal and pain-free walking distance. Together with risk-modification, supervised exercise therapy has been proven to increase walking distance ⁹².

Since the risk of limb-loss is low in the mild to moderate categories of IC, risk modification and exercise treatment are, in most cases, sufficient, but if the patient has pain at rest due to ischemia, non-healing ischemic ulcerations, and lifestyle-limiting and disabling claudication, revascularization therapy is recommended ^{93,94}. Two types of interventions exist: endovascular procedures (PTA, with or without stent), and open surgical procedures (bypass). The choice of treatment depends on location, type, and characteristic of the lesion as well as concomitant diseases ^{15,50,95}.

Clinical outcome has shown a technical (residual stenosis <30%) and initial clinical success for suprainguinal and infrainguinal PTA to exceed 90%, with an advantage in technical success for stenting. When comparing complication rates and 30-day mortality no differences could be found. The severity-adjusted 4-year primary patency rate for suprainguinal procedures were 68% for PTA and 77% for stenting ⁹⁶. In a recent review of angioplasty versus stenting for superficial femoral artery lesions, only limited benefits could be found ⁹⁷. The 5-year patency rate for suprainguinal bypass has a reported range of 75% to 91%, depending on technique. The 5-year patency for infrainguinal PTA is 43% to 55%, and 3-year patency for stent 64% to 66%, depending on stenosis or occlusion. For infrainguinal bypass, the 5-year patency rate is between 65% to 80% depending on the use of vein or PTFE graft, as well as distal anastomosis above or below knee. 5-year patency rate after infrainguinal bypass with vein graft is 60% compared with <30% with prosthetic graft ¹⁵.

The morbidity and mortality rate has been reported to be less in PTA compared to bypass procedures ^{98,99}, which together with the improvement in endovascular technique has led to the possibility of treating more high risk patients with longer lesions ^{100,101}.

Major morbidity (bronchopneumonia, renal failure, stroke, myocardial infarction) after PTA have been reported to be 2% compared to 4% with bypass. The need for emergency surgical interventions was 2% with PTA and 3% with bypass due to acute limb ischaemia and haemorrhagic complications. The amputation rate is reported to be

0% with PTA and 6% with bypass¹⁰². Independent risk factors for restenosis after endovascular treatment are the clinical stage of disease, length of lesion and outflow disease. After bypass procedures, the complications within the first year include graft stenosis (20%), graft occlusion (10% to 20%), wound complications (15% to 25%), lymphedema (10% to 20%), major amputation (5% to 10%), graft infection (1% to 3%), perioperative death (1% to 2%), and all death (10%).

Surveillance programs following revascularization are recommended for patients undergoing bypass graft placement in the lower extremities, and the aim is early identification of lesions that predispose to graft thrombosis, allowing repair prior to occlusion¹⁵.

HRQL is significantly improved after revascularization for both PTA and bypass. In two reviews of the effect of PTA on quality of life, significant improvements for both physical and mental domains were seen, especially for pain, physical functioning, sleep, energy, mental- and general health, and social isolation. The improvements were reported up to 1-2 years in some studies^{103,104}. Similar results are seen for bypass patients^{28,105-107}.

2.3 HEALTH, QUALITY OF LIFE AND HEALTH RELATED QUALITY OF LIFE

Definition

There is an agreement among researchers within the field of quality of life (QoL) of the necessity of clarifying the distinction between health, QoL and health related quality of life (HRQL) since the concepts are vaguely defined.

Traditionally, health has been viewed in terms of survival, but over the years it has shifted from being defined as freedom from disease to also include the ability to perform daily activities, as well as placing an emphasis on positive themes, such as happiness, social and emotional well-being, and quality of life¹⁰⁸. The World Health Organization (WHO) defined health as “a state of complete physical, mental, and social well-being, and not merely the absence of disease and infirmity”¹⁰⁹. Although it is generally agreed that this definition is rather utopian, the components in this definition have formed the basis for measuring QoL, but no generally accepted definition exists. It has been shown that a majority of the people define their QoL in terms of “having a positive psychological outlook and emotional well-being, having good physical and mental health and the physical ability to do the things they want to do, having good relationships with friends and family, participating in social activities and recreation, living in a safe neighborhood with good facilities and services, having enough money and being independent”¹¹⁰. It has also been argued that QoL represents “the importance of people’s subjective perceptions of their current ability to function, as compared with their own internalized standards of what is possible or ideal”¹¹¹. In a recent study trying

to enhance conceptual clarity from a nursing perspective, the concept of quality of life was examined as it has been used in contemporary nursing theories, and based on this review, quality of life was defined as an intangible, subjective perception of one's lived experience¹¹². The main theoretical models underpinning QoL are based on the concept that QoL is dependent on the individual who experiences it, and should be measured using their own value system¹¹⁰.

The concept of health is narrower and less complex in comparison with the concept of QoL and has been defined by WHO as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships and their relationship to salient features of their environment"¹¹³. It is generally considered that there is a distinction between quality of life and health, and it has been reported that health influences quality of life¹¹⁴.

Health related quality of life (HRQL) is one dimension or a part of QoL, and the concept refers to aspects of life that are affected by disease and treatment^{110,115}. HRQL influence the QoL of a person, but as described in the definition of QoL, other factors of life are important to individuals' perceived QoL. The term HRQL has been used by biomedical and health science researchers to refer to functional status, that is the ability to perform daily activities, and overall perceptions of life in light of health deficits¹¹². It has been agreed that four fundamental dimension are essential to include in HRQL measurement: physical, mental/psychological, and social health, as well as global perceptions of functions and well-being. Other dimensions that should be considered to include are: pain, energy/vitality, sleep, appetite, and symptoms relevant to the intervention and to the natural history of the disease or condition¹¹⁶. It is also generally agreed to include: general health, physical functioning, physical symptoms, emotional functioning, cognitive functioning, role functioning, social well-being and functioning, sexual functioning and existential issues¹¹⁷.

According to these definitions it is important to understand that QoL and HRQL is subjective and are best judged by the patient.

2.4 HEALTH STATUS AND HEALTH STATE

Definitions

A measure of health status, based on the concept of health, is required in order to measure health outcome¹¹⁰. HRQL can be seen as an operationalization of certain aspects of a person's health status, giving a description of health status in different dimensions¹¹⁸. While health status differs from QoL and HRQL in being less comprehensive, it also lacks aspects of the environment that may or may not be affected by health, and does not include a more global evaluation of life¹¹⁰.

Conversely, a health state includes different dimensions of health status. This allows valuing an overall health status, which comprises a health profile reflecting both improvements and deteriorations of different health states. An overall cardinal measure of health status is helpful, however, when evaluating health policies and interventions

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2.5 PREFERENCE, UTILITIES AND RISK ATTITUDE

Definitions

The word preference originates from the Latin word *præferre*, *præ*, “pre” and *ferre*, “bear”, to bear before or prefer. A preference is the expression of a value for alternative options for action after informed deliberation of their risks and benefits¹²⁰. In 1944 John von Neumann and Oscar Morgenstern developed a theory of rational decision-making under uncertainty, called expected utility-theory¹²¹. This was a normative model describing how a rational individual should make decisions if being presented with outcomes of uncertainty, and they also defined, in a set of fundamental axioms, what they meant by rational behavior under uncertainty. In short, the axioms are as follows; (1) Preferences exist and are transitive, that is for any pair of risky prospects y and y^1 either y is preferred to y^1 , y^1 is preferred to y or the individual is indifferent, (2) Independence, meaning that an individual should be indifferent between a two-stage risky prospect and its probabilistically equivalent one-stage counterpart derived using the ordinary laws of probability, and lastly, (3) Continuity of preferences, that is if there are three outcomes such that x^1 is preferred to x^2 , which is preferred to x^3 , there is a probability p at which the individual is indifferent between outcome x^2 with certainty or receiving the risky prospect made up of outcome x^1 with probability p and outcome x^3 with probability $1 - p$. Being a normative model, and not a behavioral model, it does not describe how a person actually makes a decision.

Preference is the umbrella term describing the overall concept; utilities and values are different types of preferences. There are different methods for measuring preferences and, depending on the chosen method, either a value or a utility is captured¹¹⁹.

When measuring preferences a question can either be framed under certainty or uncertainty. Asking a question framed under certainty means that the person is asked to compare two or more outcomes and choose between them or scale them. The outcome is described to occur with certainty, with no unknowns or probabilities. A question framed under uncertainty asks the person to compare two alternatives, where at least one of the alternatives has an uncertain outcome, containing probabilities. The latter question is a direct application of the von Neumann-Morgenstern third axiom, and captures a person’s risk attitude.

Von Neumann-Morgenstern utility-theory is only applicable to individual decision-

making, but it has been argued that it can be used to inform societal decision-making if seeing society as an individual ¹¹⁹.

Risk attitude is a concept recognized in preference measurement and utility-theory ^{21,122,123}. A utility captures both a person's preference and their risk attitude toward risk. In theory, a person can either be *risk-averse*, meaning that he/she shies away from risky alternatives in favor of less risky alternatives, *risk seeking* if preferring a risky alternative, or *risk neutral* if being indifferent. The concept has been operationalized mathematically by measuring preference over particular outcomes of uncertainty that are defined on an interval scale. The definition of risk-averse is when a person prefers the expected value of an uncertain alternative to the certain alternative itself, risk neutrality when being indifferent between the two alternatives, and risk seeking when preferring a gamble. Risk attitude only pertains to a specific question, and there is not a consistent risk attitude over multiple questions. ^{108,119}.

2.6 MEASUREMENTS

Clinical trials should incorporate the patient's perspective of outcome, and for complete assessment of the benefits of an intervention it is important to provide evidence of the impact on the patient's HRQL ¹²⁴. It is important to use measures that capture dimensions of HRQL that are sensitive to change over time, especially when patients are treated for chronic or life-threatening conditions. The evaluation of therapy should reflect whether it leads to an outcome of a life worth living in social, psychological and physical terms ¹¹⁰. Growing evidence is indicating that assessment of QoL can assist clinical and psychological assessments, and this approach is postulated to be the "gold standard" in evaluation and assessment of healthcare ¹²⁵, and further, these results give valuable information when planning medical and nursing interventions and care. The subjective health measurements extend the information obtainable from morbidity statistics or physical measures by describing the quality rather than merely the quantity of function ¹⁰⁸.

During recent years a number of standardized questionnaires have been developed to measure outcomes from the patient's perspective and there are five main types of measures in use: (1) generic, (2) disease or population-specific, (3) dimension-specific, (4) individualized measures, and (5) utility measures.

Generic instruments can be used across different disease categories because they cover several health domains, whereas disease or population-specific measures include aspects of health that are relevant to certain health problems. A dimension-specific measure addresses particular aspects of health, such as anxiety, and individualized measures allow the subject to include and weight the importance of aspects of their QoL. Finally, utility measures incorporate preference for health states and outcomes

When measuring HRQL as an outcome, it is recommended to combine generic and disease-specific instruments in order to generate complementary information^{127,128}. These instruments can also be combined with any of the other instruments depending on breadth of the concept being measured and the focus of the evaluation. In health-economic evaluations, when wanting to integrate changes by an intervention in both length and quality of life, HRQL and utility measures are combined to generate one single index^{119,129}.

Generic instruments

Examples of generic instruments assessing broader health status or HRQL is the Short Form 36 Health Survey (SF-36)¹³⁰, Nottingham Health Profile (NHP)¹³¹ and Sickness Impact Profile (SIP)¹³² and these instruments are also the most widely evaluated generic measures¹²⁶.

The SF-36 and NHP are the most frequently used instruments in evaluating HRQL in patients with AAA and IC. When testing their validity, reliability and responsiveness to change in patients with IC, it was shown that SF-36 was the most appropriate instrument with the best psychometric properties, but NHP discriminated best among levels of ischemia and were most responsive to change in both the short- and long-term^{13,133,134}. The SF-36 has been shown to demonstrate good validity as well as being responsive to expected change in HRQL after AAA surgery¹³⁵ and this instrument has been the measure of choice in several randomized controlled trials (RCT) when evaluating AAA treatment^{55,136-138}.

The EQ-5D¹³⁹⁻¹⁴² is an example of a short instrument used for eliciting valuation of health. The instrument provides a multi-dimensional health profile or health state, which can be converted to a single summary index value. EQ-5D have been used both in patients with IC and AAA.

Disease-specific instruments

Generic instruments may not detect specific aspects of a disease or condition that affects a person's health, or be sensitive to small but clinically significant changes in QoL after treatment; therefore more disease-specific instruments are required. Several instruments have been designed and developed over the years to assess the specific impairments seen in patients with IC: WHO/Rose Questionnaire¹⁴³, Walking Impairment questionnaire (WIQ)¹⁴⁴, The Claudication Scale (CLAU-S)¹⁴⁵, Claudication Questionnaire (ICQ)¹⁴⁶, The King's College Hospital's Vascular Quality of Life Questionnaire (VascuQoL)¹⁴⁷, and The peripheral Artery Questionnaire (PAQ)¹⁴⁸. Some of these instruments are new and have undergone a limited validation process^{149,150}.

Utility measurement

Health measures have been developed by clinicians to obtain the health of individual patients, whereas economists have contributed to measures that are intended to be applied to groups of people. With the economic approach there has been a tendency to develop health indexes instead of profiles, and the focus has been on details of scaling rather than question wording¹⁰⁸. The econometric scaling technique is an attempt to assign a numerical value on a health state, and one of the most well-known applications is the quality-adjusted life year (QALY). The advantage of using a QALY as a health outcome is that it captures the gains of an intervention both in reduced morbidity and reduced mortality in a single value. This value can then be used in health-economic evaluations by evaluating the cost of an intervention by the cost per QALY gained. The QALY outcome allows comparison both within and between different disease groups¹¹⁹.

When operationalizing the QALY concept, it is necessary to obtain a quality weight that represents the HRQL of the health state under consideration, and to satisfy the concept, the weight must be based on: (1) preferences, (2) anchored on perfect health and death, and (3) measured on an interval scale.

There are different methods for measuring preferences, and some key factors of the measurement process have to be recognized because the different methods generate either values or utilities. Using a scaling task or a choice method under certainty generates a value, and using a choice method under uncertainty generates a utility¹¹⁹.

The most widely used techniques for measuring an individual's direct preference for a health outcome are: the rating scales (including category scales and visual analogue scales), standard gamble (SG), and the time-trade off (TTO)¹⁵¹⁻¹⁵⁵.

An alternative to direct elicited preference scores, which can be time consuming, is to use a pre-scored multi-attribute health status classification. The most widely used classification systems are: Quality of Well-being (QWB)^{156,157}, Health Utilities Index (HUI)^{158,159}, EQ-5D^{139,160,161}, and the Short-Form 6D (SF-6D)¹⁶².

In the current study we have used TTO, SG, EQ-5D VAS and UK EQ-5D Index to elicit direct and indirect preference for a health outcome, since these techniques in various extents have previously been used in studies on patients with AAA and IC.

In summary, the measures used in this thesis can give additional knowledge on the physically and emotionally effect of disease and treatment in patients with AAA and severe IC, and how this in turn may influence preference for treatment. This information is important since current knowledge of the patient's perspective is still limited in these patients groups. The quantitative data received from these measures

gives a possibility for generalization, which is important. But certain aspects may not be obtainable; instead qualitative methods can be used to give a deeper understanding of the patient's experience. This information is difficult to generalize; instead it should be seen as a complement to the quantitative information in order to get a broader view regarding the impact of disease and treatment.

3 AIMS OF THE STUDIES

The overall aim of the studies in the thesis was to investigate the effect of information on well-being, and further, to describe risk attitude and preference for treatment of abdominal aortic aneurysm (AAA) and severe IC, as well as to illuminate patients' lived experience of the care pathway of open repair (OR).

The more specific aims were:

To investigate the effect of the provision of additional written preoperative information compared to best practice on postoperative physical and psychological well-being in patients with AAA treated with OR (paper I).

To illuminate patients' lived experience of the care pathway of going through OR for AAA (paper II).

To assess risk attitude and preference for treatment of open repair for AAA (paper III).

To evaluate the perception of symptoms and HRQL in relation to risk attitude before and after treatment of severe IC, and to assess cost effectiveness of treatment (paper IV).

4 MATERIAL AND METHODS

4.1 DESIGN

This thesis consists of four clinical studies combining quantitative and qualitative methods to get both an objective and subjective perspective on AAA and IC and vascular treatment, as well as a deeper understanding of what constitutes reality for patients with AAA before and after open repair. Using both qualitative and quantitative methods allows the researcher to get a deeper insight from their studies, but there are limitations with both approaches.

The quantitative approach was selected with a descriptive, comparative and correlation design to investigate the significance of information on patients' mobilization (Paper I), and to compare HRQL, risk attitude and preference for treatment before and after vascular intervention, as well as in a hypothetical situation (Paper III and IV). A qualitative approach, using content analysis was employed to describe the lived experience of patients with AAA treated with open repair (Paper II).

Paper I. A pre- and post-test design using a consecutive group randomized to either an experiment or control group was used to determine the effect of structured written preoperative information compared to standard verbal information on physical and psychological well-being during the first week of recovery after open repair of AAA. The strength of this design is the possibility to control confounding factors, which allows the researcher to make casual inferences without the risk of interpreting differences caused by other factors than the intervention itself.

Paper II. A qualitative approach was used to describe the individual patient's lived experience of the surgical pathway of going through open repair for AAA. Using a qualitative design emphasizes the patient's perspective with its unique context, experience and resources, which enables the researcher to get a deeper understanding of how patients perceive a certain situation. The result from a qualitative design can be a valuable supplement to the results from questionnaires and clinical parameters to obtain a fuller picture of the impact of disease and treatment.

Paper III. A comparative design using a stratified sample from the general population and a group of patients eligible for elective surgery were used to describe and compare the perception of risk attitude and preference for treatment between age groups within the population sample as well as between age groups and the patient group. The general population group was stratified in four age groups and each group reflected the gender mix seen in patients with AAA.

Stratification may be used to control for confounding, with less risk of bias in the interpretation of the result. In this study the outcome measures in the general population sample were based on a hypothetical situation, which allows the researcher to investigate a situation where it may, for ethical reasons, be difficult to use a patient group.

Paper IV. A pre- and post-test design with one group was used to determine the effect of HRQL and symptom severity on risk attitude and preference for treatment in patients with severe IC before and 6 months after revascularization, and to assess cost effectiveness. In this design the sample provide their own controls which allows a comparison of the study variables with the effect of treatment.

4.2 SAMPLES

Papers I-IV are based on five samples including a total of 79 patients eligible for treatment of AAA (paper I n=37, II n=10 and III n=63) and severe IC (paper IV n=50) as well as general population sample (paper III n=200). The samples in study I, II, and IV were recruited from the Department of Vascular Surgery, Karolinska University Hospital. The samples in study III were patients registered in the Swedish quality register SWEDVASC, and a general population sample obtained from the Swedish governmental address register (SPAR), stratified in four age groups; 50-59, 60-69, 70-79, >80, with the same gender mix seen in patients with AAA (4:1 male to female). The identification of potential patients to the studies and invitation by an information letter were performed by one of the researchers (paper I) and a registered nurse responsible for coordination of surgery and admission to the Department of Vascular Surgery (paper II and IV). The demographic characteristics of the patients are presented in Table 2.

Table 2. Demographic characteristics of the participants of the studies

	<i>PAPER I</i> (N=37)	<i>PAPER II</i> (N=10)	<i>PAPER III*</i> (N=63)	<i>PAPER IV</i> (N=50)
Age m (range)	71.3 (56-83)	73.0 (55-83)	72.0 (48-89)	66.9 (45-83)
Gender n (%)				
Male	31 (84)	6 (60)	53 (84)	30 (60)
Female	6 (16)	4 (40)	10 (16)	20 (40)
Aneurysm size m (range)	5.7 (4.8-10)	6.3 (4-8)	6.0 (3-10)	
Type of intervention for AAA n (%)				
OR	37 (100)	10 (100)	46 (73)	
EVAR	0	0	17 (27)	
Leg side severe IC n (%)				
Unilateral symptoms				19 (38)
Bilateral symptoms				31 (62)
Type of intervention for severe IC n (%)				
Angioplasty				29 (58)
Bypass graft				21 (42)
Risk factors n (%)				
Previous smoker	9 (24)	4 (40)	-	23 (46)
Current smoker	15 (41)	4 (40)	3 (5)	27 (54)
Diabetes	4 (11)	0	13 (21)	10 (20)
Hyperlipemia	3 (8)	2 (20)	28 (44)	(48)
Hypertension	21 (57)	7 (70)	29 (46)	28(56)
Cardiovascular disease	20 (54)	3 (30)	28 (44)	15 (30)
Cerebrovascular disease	2 (5)	1 (10)	13 (21)	3 (6)
Chronic lung disease	5 (14)	3 (30)	14 (22)	4 (8)
Kidney disease	6 (16)	1 (10)	3 (5)	0

*Including a sample of 200 individuals from the general population

Paper I. The sample size of patients eligible for the study was based on the total sum of patients treated for AAA with OR during a year at the department. The inclusion criteria were patients scheduled for OR with no difficulties to speak or read Swedish and having the physical and mental ability to complete questionnaires. Exclusion criteria were a prolonged stay at the ICU > 3 days. Patients who fulfilled the criteria for

inclusion were consecutively randomized to either experimental group or control group. A sample of 52 patients were eligible for inclusion, of these, 15 patients were excluded due to medical reasons (n=3), postoperative death (n=3), postoperative disorientation (n=1), withdraw of consent (n=4) and >3 days at ICU (n=4). The proportion of excluded patients were EG (n=7) and CG (n=8).

Paper II. Ten patients with AAA treated with OR at the department of Vascular Surgery at the Karolinska Hospital, were included in the study. A purposive sampling technique¹⁶³ was used to obtain as rich interviews as possible about the care pathway. This meant interviewing patients who either had experience of an uncomplicated treatment or a treatment involving complications. Complications were defined by having a prolonged stay at the ICU for more than 2 days and/or receiving treatment during hospital stay for any medical complications. Patients fulfilling the inclusion criteria were contacted consecutively after being identified by the nurse responsible for planning surgery and admission. The sample size was determined after reaching saturation, which means that the sampling is terminated when no new information is received during the interviews¹⁶³. None of the contacted patients declined to participate in the study.

Paper III. A general population sample of 200 individuals stratified in four different age groups (50-59, 60-69, 70-79 and >80) with the same gender mix as seen in patients with AAA (4:1 male to female) were selected from the Swedish governmental address registry (SPAR). A response rate was expected of 50%, due to the hypothetical situation and interview technique applied; therefore 400 individuals were allocated initially from the registry. These individuals were consecutively chosen from the list, invited to the study and later contacted by telephone.

Data from patients scheduled for vascular treatment of AAA registered in the Swedish national quality register (SWEDVASC) were collected for the study. Of the 79 patients eligible for inclusion 63 were included in the study. The reason for exclusion was either surgery for ruptured AAA or missing data in all dimensions of EQ-5D.

Paper IV. A sample size of 50 consecutive patients with severe IC categorized according to Rutherford's categories⁷⁵ and planned for revascularization at the Department of Vascular Surgery at the Karolinska Hospital were included in the study. Inclusion criteria was a pain-free walking distance of <200 meters. Patients were excluded if previous treated for PAD with a revascularization procedure. Patients fulfilling the inclusion criteria were identified by the nurse responsible for planning surgery and admission and consecutively recruited to the study. None of the patients eligible for inclusion declined, nor were there any drop-outs. Due to the small category of patients never treated for severe IC, data collection was considered to take considerable time, and therefore the sample size was determined to be large enough for a comparative statistical analysis.

4.3 DATA COLLECTION

The methods used for data collection were HRQL, Health status and Walking ability questionnaires (Papers I, III, IV), interviews (Paper II, III, IV) and physical assessment (Paper IV). An overview is presented in Table 3.

Table 3. Methods used in the studies

Methods	Content	Instrument	Paper
Questionnaires	Health status	Health Index EQ-5D self-classifier	I III, IV
	Physical and psychological well-being	Study-specific questionnaire	I
	HRQL	SF-36	IV
	Indirect risk attitude/preference value	UK EQ-5D Index EQ-5D VAS	III, IV IV
	Walking ability	WIQ	IV
Interviews	Direct risk attitude and preference	SG TTO	III,IV III,IV
	Lived experience of the care pathway	Qualitative interview	II
Physical assessment	Walking ability	Treadmill	IV
	ABPI	Doppler technique	IV

4.4 QUESTIONNAIRES

The **Health Index (HI)** was originally developed by Hansagi & Rosenqvist in the early 80's (unpublished data), and first published in 1992¹⁶⁴. The questionnaire measures health status and consists of 10 items concerning energy, temper, fatigue, loneliness, sleep, vertigo, bowel function, pain, mobility, and general health. Each statement has a four-grade Likert scale, which ranges from 1 to 4 (very poor to very good). The scores are summarized to form a health index ranging from 10 to 40. The higher the score, the better the self-rated health. The respondents are asked to answer the question on the basis of their usual health situation, not with regard to their current health. In a factor analysis two factors were defined: emotional well-being and physical well-being. The item concerning general health was related to general well-being¹⁶⁴.

In classical test theory a value obtained from any measurement is viewed as a combination of two components: an underlying true score and some degree of error. The reliability of a measure is the measure's ability to detect the true score rather than measurement error, and specifically, to evaluate the extent to which a score is free from random errors^{108,165-167}.

Validity has been defined as "the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests". It is recommended that validity is sought through five sources: content, response process, internal structure, relationship to other variables, and consequences, and these sources build the foundation of construct validity also referred to as the whole of validity¹⁶⁷. Validity is also context-specific and therefore validating an instrument must be viewed as a process where evidence is accumulated to support the meaningfulness of the measurement¹⁶⁸.

In this thesis four single items were added to reflect perceived health specific to AAA patients: (1) *How do you perceive your overall health during the past week?* (2) *How do you perceive your general state of health?* (3) *Does the AAA affect your life situation?* (4) *Do you have any other diseases right now?* The HI was used before treatment in both EG and CG to complement the baseline value received from the study-specific questionnaire.

Reliability for the HI has been tested in different patient populations with a correlation exceeding the minimum standard of correlation of 0.70 used for measures in group comparison (0.74 to 0.85), and has also shown discriminant validity, meaning the extent to which scores on a measurement distinguish between individuals or populations that would be expected to differ, for example, people with or without the disease^{164,169-171}.

A **Study-specific Questionnaire** was developed by the authors to assess the effect of enhanced knowledge on psychological and physical well-being. The items were chosen to reflect areas of specific concern to patients scheduled for treatment of AAA. These areas were: mood, appetite, nausea, sleep, physical activity and bowel function.

The measurement procedure included using the single-item method, which provides subjective summary indicators of a range of aspects of health, including feelings about specific aspects of health. They can be used in population surveys and clinical settings¹⁰⁸. There are different forms of single-item response scales, and for the study-specific questionnaire the visual analogue scale was used (VAS). This is a ten centimeter line representing a continuum running from the worst possible to perfect. The line is often marked with a label at each end to indicate the range considered, and the respondent places a mark on the line to indicate the subjective health. The VAS scale was used to measure mood, sleep, appetite and nausea. Physical activity and bowel function were measured using four response categories each, such as "Can stand by the bed", "Can ambulate in the hall with support", "Can ambulate in the hall without support", "Can manage all activities of daily living", "Bowel sound", "Passage of flatus", "Diarrhoea" and "Passage of stool". All patients were assessed before and after OR. After treatment, the assessment took place each day during seven days after returning to the ward with

one of the researchers assisting, since a majority of the patients had difficulties filling in the questionnaire themselves.

The **SF-36** was originally derived from the work of the RAND Corporation of Santa Monica in the 1970s, which was a health insurance experiment comparing the impact of alternative health insurance systems. The outcome measures developed for the study have later been refined and used in RAND's Medical Outcomes Study (MOS) where they covered 40 physical and mental health concepts¹⁷². After several versions of the questionnaire the MOS 36-Item Short-Form Health Survey (SF-36) was constructed, covering eight of the original 40 concepts to satisfy the minimum psychometric standards necessary for group comparison, and designed as a generic indicator of health status for use in population surveys and evaluative studies of health policy¹³⁰. Later, a second version was introduced to improve the two role function scales and to focus objectives¹⁷³.

As a generic instrument it is applicable to a wide range of types and severities of health conditions, and can be used for comparison of health status between different patient groups, between patient group and general population, and monitoring patients with multiple conditions¹⁰⁸. The SF-36 includes multi-item scales to measure the eight dimensions. These are: PF: Physical functioning (10 items), RP: Role limitations due to physical health problems (4 items), BP: Bodily pain (2 items), MH: General mental health, covering psychological distress and well-being (5 items), RE: Role limitations due to emotional problems (3 items), VT: Vitality, energy or fatigue (4 items), and GH: General health perceptions (5 items). All but one of the 36 items (self-reported health transition) is used to score the eight scales. Two sets of scores are derived from SF-36; a profile of eight section scores, and two summary scores, one for the physical component (PCS) and one for the mental component (MCS). Each scale is summed according to the method of summated ratings and SF-36 scoring algorithms to form a scale ranging from 0 to 100, with the highest score indicating best possible health state^{174,175}. The standard version uses a four-week recall period, but there is also an acute version which uses a one-week period.

In this thesis the Swedish SF-36 Health Survey with a recall period of four week was used¹⁷⁶ to investigate the impact of HRQL on risk attitude and preference in patients with severe IC before and six months after revascularization.

The reliability of SF-36 has been estimated using both internal consistency and test-retest methods. Most of these studies, which were conducted on diverse patient groups differing in socio-demographic characteristics, have exceeded the minimum standard of correlation of 0.70, used for measures in group comparison¹⁷⁵⁻¹⁷⁸ and the reliability estimates for PCS and MCS exceed 0.90¹⁷⁴.

SF-36 is a widespread instrument and a range of studies have reported evidence on construct validity¹⁷⁹. The ability of the scales to discriminate between types and levels of disease and a combination of both has been established^{180,181} as well as discriminate between well and sick people¹⁸²⁻¹⁸⁴. The change of health status over time after revascularization in patients with different severity of IC has been shown, which has proven the SF-36 responsiveness to change^{13,185,186}.

EQ-5D self-classifier, (The European Quality of Life, EuroQoL) was developed by a consortium of investigators¹³⁹. It is a generic HRQL instrument where the respondents classify their health status into five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels of severity: no problems, moderate problems, and severe problems, thus defining 243 possible health states, with two additional states added (unconscious and dead), ending up with a total of 245. The instrument originally consisted of six levels but was later revised to five¹⁴⁰⁻¹⁴². EQ-5D was designed for surveys and thus intentionally kept short with only a core set of generic QoL items, and the purpose of the instrument was for use in overall decision-making.

EQ-5D consists of three parts: (1) the self-classifier, (2) a rating scale using a 100 point VAS thermometer-scale with the anchors 0 (the worst imaginable health state) and 100 (best imaginable health state), and (3) a standard set of question concerning socio-demographic variables (optional). Part one can be used to provide a HRQL profile as well as generate a weighted health index or utility value. The index value is based on a valuation of a set 42 of EQ-5D health states using the TTO technique from a representative sample of the population in the UK and is referred as the **UK EQ-5D Index**^{160,161,187,188}. Population values using the same technique are also available for other countries.

In this thesis part one and two of EQ-5D self-classifier was used to evaluate HRQL and to generate an index value showing indirect risk attitude in patients with severe IC before and six months after revascularization. Part two consisted of the endpoints of dead (0) and best imaginable health state (100). The UK EQ-5D Index was also used to derive utility values for calculation of quality adjusted life years (QALY) to evaluate cost-utility of revascularization in patients with severe IC.

Part one of the EQ-5D and UK EQ-5D Index was used to generate a value of risk attitude before planned endovascular or surgical treatment of patients with AAA.

The reliability has been tested for both the original and the new version using test-retest, showing for a group level coefficient a range of 0.69-0.94 for the original, and 0.86 for the new version^{189,190}. Evidence of the construct validity showed that the health state scores were associated with age, gender and socio-economic status in the expected direction. The instrument was also able to discriminate between disease groups^{191,192}.

It has been suggested that the current version should be revised to better capture health states, and to meet methodological problems such as ceiling effects, bias due to the length of the VAS scale, and time referent being too short by using the term “today”. This has been recognized by the EuroQoL group but no new revision has been done¹⁴¹. Population norms have been produced for more than 15 countries including Sweden¹⁹². The responsiveness of change over time after revascularization has been tested, showing significant improvements in mobility, usual activities and pain/discomfort¹⁹³⁻¹⁹⁵.

The **Walking Impairment Questionnaire (WIQ)** was originally developed in the USA to evaluate walking ability in patients with PAD¹⁹⁶. The questionnaire contains four questions: (1) includes two sections; section A specific for buttock or calf claudication, and section B differentiates other symptoms which limit walking ability,

and the following questions evaluate (2) walking distance, (3) walking speed, and (4) ability to climb stairs. The total score is the sum of the mean score from each question with a range of 0 (perceive much difficulty) to 100 (no difficulty).

In this thesis an additional item was added to evaluate the limited walking ability on daily life, on a four point Likert scale ranging from 0 (very much) to 4 (not at all). The WIQ questionnaire was used to evaluate the effect of walking ability on risk attitude before and six months after revascularization in patients with severe IC.

The reliability and validity has been established by correlating the WIQ distance and speed scores with treadmill walking time and ABPI showing strong correlations¹⁹⁶⁻¹⁹⁹. The questionnaire has shown good reliability and validity for both self-administration and telephone interviews²⁰⁰, and responsiveness to change after treatment of patients with IC^{199,201,202}. It has also been reported in recent studies that WIQ is the most specific questionnaire evaluating walking ability in patients with PAD, and is reliable for use as an alternative to treadmill testing^{10,203}.

4.5 INTERVIEWS

Two methods of undertaking an interview were used in the thesis. The first method involved asking questions using the scaling method to elicit risk attitude and preference, and the second method was a qualitative interview using open ended questions to evaluate patients' lived experience of treatment.

To evaluate risk attitude and preference, a standard gamble (SG) and a time trade-off (TTO) question were asked. These methods were developed for use in economic evaluations, giving a preference/utility value for a health benefit. The assessed utility is then used for QALY calculations. A QALY combines both morbidity and mortality in a single scale by calculating the gain in terms of HRQL times the expected life years. In an economic evaluation, QALY measures are used for calculating the incremental cost per QALY, which is used for policy analysis at group level, when comparing different interventions rather than the health gain of the individual patients^{119,129}.

The SG is the classical method of measuring risk attitude and cardinal preferences since it is directly based on utility theory which is a prescriptive model suggesting how people make decisions under uncertainty¹²¹. During the interview the subject is offered two alternatives:

1. A treatment with two possible outcomes: either the patient returns to perfect health (or the health state without the condition) and lives for an additional t years (probability p), or the patient dies immediately (probability $1-p$).
2. The certain outcome of a health state i for life (t years).

The alternatives are varied until the respondent is indifferent between the two alternatives, at which point the required preference score for stat i for time t is p ; that is $h_i = p$ (Fig 1.1). The utility is measured on a 0 (dead) and 1 (perfect health) scale. This shows how great a risk of mortality the respondent would tolerate to avoid remaining in

their condition ^{108,119}. The traditional method using the SG method is by face-to-face interview, using a script and, if possible, visual aids ¹⁵⁵, but recently other methods have been utilized, such as computer approaches, paper-based questionnaires, and group interviews with paper-based responses.

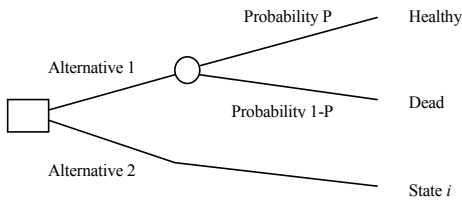


Fig 1.1 Standard gamble for a chronic health state preferred to death (Drummond et al. 2005).

The TTO method was developed for use in health care as a simpler and more easy to use alternative to the SG, yielding comparable scores ^{151,204}. It has been shown that TTO frequently yields a lower estimate, which is explained by the violation of the assumption that that all future years of life have the same marginal utility, that is the utility function is linear ²⁰⁵. In a TTO interview the respondent is offered two alternatives:

1. State i for time t (life expectancy of an individual with the chronic condition) followed by death.
2. Healthy for time $x < t$ followed by death.

Time x is varied in until the respondent are indifferent between the two alternatives, at which point the required preference score for state i is given, $h_i = x/t$ (Figure 1.2). As for the SG, the utility is measured on a 0 (dead) and 1 (perfect health) scale.

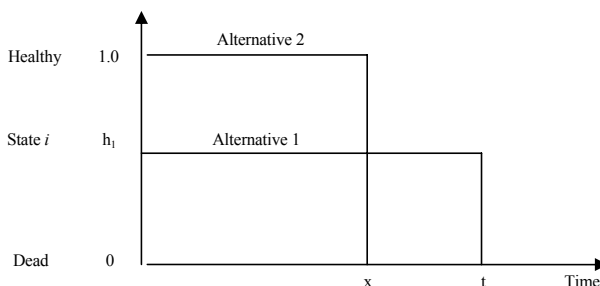


Fig 1.2 Time trade-off for a chronic health state preferred to death (Drummond et al. 2005).

It is important to specify the duration of a health state for both techniques, and not to be vague or unspecific regarding the prognosis which otherwise would lead the subject to interpret the questions differently¹⁵³. The assumption underlying the concept of SG and TTO is that the more undesirable the current health state is perceived, the more likely it is that an individual will accept a greater probability of death or a shorter life in a better health state. Both techniques can be used for both chronic and temporary health states.

In this thesis the time frame of 10 years was used for both SG and TTO questions assessing risk attitude and preference before and after revascularization of severe IC were asked in a face-to face interview, and to assess risk attitude and preference in a general population sample hypothetically facing treatment of AAA, questions were asked by means of a telephone interview.

The construct validity have only been tested in a small number of studies showing small to moderate correlations with health status measures, and different techniques produce different values for the same health state²⁰⁶⁻²⁰⁸. The feasibility, validity and test-retest reliability were tested comparing VAS and TTO, showing that the TTO technique could discriminate more effectively between different health states, and also demonstrating a tendency to be more sensitive to differences by socio-demographic variables²⁰⁹. In a review of health state valuation techniques it was concluded that SG and TTO are best placed to reflect the strength of preference of health and little difference in reliability was seen between them. The empirical evidence relating to the theoretical perspective of the different techniques showed problems in terms of descriptive validity²¹⁰. In a more recent study SG showed better construct validity than TTO by better reflecting HRQL and patients' preference²¹¹.

Few studies have used these techniques to assess risk attitude and preference for treatment in patients with PAD, and these have showed small to no correlations with HRQL measures and clinical measures, or discriminate between patients with different symptom severity on a group level^{22,23}. No previous studies were found to have used TTO or SG techniques to evaluate preference for treatment in AAA patients.

A qualitative interview was used to gain richer and deeper information about the lived experience of the care pathway of AAA treatment since this method of data collection emphasizes that people who have experienced a certain event or phenomenon are the best ones to describe this by using their own words and narratives. Collecting data through qualitative interviews can be done using different approaches. In this thesis a semi-structured interview guide was used¹⁶³.

An interview guide can vary greatly in detail depending on the research questions posed and the aim of the interview. If the guide has many predefined questions, the interview may not capture phenomena experienced by the respondents, and the potential for flexibility and interaction between researcher and respondent may decrease. In this thesis the semi-structured interview guide consisted of topics covering areas of interest linked to the aim of the study which related to the experience of the care pathway.

Knowing that HRQL can be negatively affected during the first three months after OR, all interviews were performed after this period to ensure that the participants had the physical and mental ability to participate.⁵⁶ To create an atmosphere that felt relaxed, each respondent could choose the time and location for the interview, which was either in their home or at the hospital. Before starting the audio-taped interview a moment was taken for conversation in order to establish a trustful relationship.

Each interview started with an open question, aiming to encourage the respondent to talk freely about his/her experience of the care pathway. To get as rich data as possible, follow-up questions concerned reactions, feelings and thoughts. If the topics in the interview guide were not addressed, more specific questions were asked like “*Can you tell me what your impressions of the preoperative information were?*”

Before rounding up the interview the respondents were asked twice if there was anything further they would like to add. The first time the question was before turning off the tape-recorder, and the second time was a couple of minutes afterwards, to ensure that any further information, which the respondents may have felt more easy to communicate without the tape recorder on, was captured. If any new information was received, notes were taken and included in the analysis. All interviews were audio taped and lasted 60 to 90 minutes and transcribed verbatim by a trained medical secretary.

4.6 PHYSICAL ASSESSMENT

Clinical examinations included ankle brachial pressure (ABP), ankle brachial pressure index (ABPI) and treadmill exercise as objective measures of severity of disease and walking ability according to recommendations for the detection of lower extremity arterial disease¹⁵

ABP is measured by using a Doppler probe placed either on the dorsal pedis artery or the posterior tibial artery. The assessed value is then divided with the highest brachial pressure to receive an ABPI. A normal dorsal pedis or posterior tibialis pressure should be equal or higher than the brachial pressure (>1.0). IC has been defined by an ABPI <0.90 , and the lower the index the more severe the disease. These measurements serve as an initial standard noninvasive procedure to detect IC and later, to evaluate the severity of the disease as well as treatment. To evaluate the extent of severity, ABP can be measured before and after exercise, often showing a decreased pressure afterwards. There are also other methods available such as a standardized treadmill test, to evaluate the effect of disease severity on walking ability. When using a treadmill test, a specified speed and grade are used. The grade can then either be maintained during the whole test or increased with a certain interval. As the patient walks on the treadmill, a measure of initial claudication distance (ICD), which is defined as the distance for onset of pain, as well as absolute claudication distance (ACD), defined as the distance to the maximum claudication pain, should be specified²¹².

In this thesis physical assessment with ankle brachial index and treadmill test were used before and six months after revascularization in patients with severe IC, and ABPI and ACD were used as outcome measures.

4.7 DATA ANALYSIS

Statistical analysis

All statistical methods used in paper I-IV are presented in Table 4. Non-parametric statistical measures were used to analyze ordinal data and non-symmetrical distributed continuous data. Descriptive statistics were used to present sample characteristics and information about the distribution of key research variables using appropriate methods for symmetrical and non-symmetrical distributed data. Statistical significance was defined as p-value <0.05. Statistical analyses were performed by Stat View 5.0, SPSS 14.0 and SPSS 17.0 for Windows.

A more detailed description of the statistical methods used in the different studies is described below.

Table 4. Statistical methods and qualitative analysis used in paper I - IV

	<i>Paper I</i>	<i>Paper II</i>	<i>Paper III</i>	<i>Paper IV</i>
Mann-Whitney <i>U</i> test	X		X	X
Wilcoxon signed ranks test			X	X
Paired <i>t</i> test			X	X
Kruskal-Wallis one-way analysis of variance			X	
Spearman's rank correlation coefficient	X		X	X
Cronbach's alpha	X			
Qualitative latent content analysis		X		

Paper I. Non-parametric methods were used because of the small sample and data not being symmetrical distributed. Non-parametric methods based on ranks are used to analyze a numerical outcome variable without assuming that it is approximately normally distributed, and the key feature of these methods is that each outcome value is replaced by its rank after being sorted into ascending order of magnitude²¹³.

To examine the difference between the two groups (EG and CG) the Mann-Whitney *U* test was used for analyzing (1) the differences in HI scores before treatment, and (2) VAS scores for psychological well-being before and after treatment.

To measure the strength of association between the VAS scores for psychological well-being and aneurysm size as well as length of day and days at the ICU, the Spearman's

rank correlation coefficient was used. Numbers were used to describe physical ability and bowel function before and after treatment.

The internal consistency for HI was calculated by using Cronbach's alpha ²¹⁴.

Paper II. A qualitative content analysis was used to analyze the latent content of the transcribed texts from the interviews ^{215,216}. Content analysis is described as a research method that provides a systematic and objective means to make valid inferences from verbal, visual, or written data in order to describe and quantify specific phenomena, and the findings have to be considered and justified from the context or environment that produce the data. The objective of content analysis is to provide knowledge and understanding of the phenomena under study ²¹⁵.

Content analysis can either be used for quantitative analysis of texts such as frequency, order, or intensity of occurrence of words, phrases or sentences, or in qualitative analysis to describe the manifest or latent content ²¹⁷. It is important to initially decide if the analysis should focus on the manifest content (the visible and obvious components) or the latent content (the interpretation of the underlying meaning of the text). Both the manifest and latent content deal with interpretation, but they vary in depth and level of abstractions. In many cases a text involves multiple meanings leading to some degree of interpretation when approaching it ²¹⁶.

There are no single set of rules in how a content analysis should be performed, but some general steps have been described. In this thesis the analysis of data was inspired by qualitative content analysis described by Graneheim & Lundman 2004. The first step is to select the unit of analysis, which in this case is the interview text. These transcribed texts are then carefully read and re-read to gain an overall meaning of the phenomena of interest, which, in this thesis, was the experience of the care pathway described by patients undergoing OR for AAA.

The next step is to identify meaning units, i.e. words, phrases, sentences or paragraphs containing aspects related to each other through content or context, and in this study the meaning units were sorted in relation to the three transitional phases of the care pathway: 'before surgery', 'during hospital stay', and 'being at home'.

These meaning units were then condensed, which refers to the process of shortening while still preserving the core meaning, and the condensed meaning units that were related to each other were then abstracted to create sub-themes. The content of the sub-themes were compared to others looking for differences and similarities, and this process lead to further development of themes. The process of abstraction involves interpretation on a higher logical level, describing the latent content analysis.

To ensure trustworthiness of the findings, all steps were validated by using three researchers who first independently, and then together, read and discussed the findings in relation to the aim, original texts and the pre-understanding in order to ensure a sound interpretation. A pre-understanding can influence objectivity when analyzing the text, a consequence which was avoided by using two researchers not familiar with this patient group. The principal researcher's own pre-understanding consisted of the experience as a nurse caring for these patients at the vascular department and this experience was discussed with the other researchers to identify potentially

predetermined interpretations. To further increase trustworthiness, illustration of the research findings and interpretation of the content by using the most representative quotations from the informants were included in the report²¹⁸.

Paper III. Non-parametrical tests were used to examine the following outcomes: differences within age groups in TTO and SG values reported by the general population sample by using the Kruskal-Wallis one-way analysis of variance, differences in the health utility scores (TTO, SG and EQ-5D Index) between patients and the general population sample as well as between age groups within the general population sample by using Mann-Whitney *U* test, and to analyze the difference between TTO and SG values within each age group in the general population sample the Wilcoxon signed ranks test was used.

The strength of association between TTO values reported by the different age groups in the general population sample and the patients were analyzed with the Spearman's rank correlation coefficient.

The Chi-squared test was performed on the categorical variables (disease knowledge, family situation, current diseases) to analyze if any of these background variables had affected TTO and SG values.

Paper IV. A parametrical statistical test was used to compare the mean difference for walking ability measured on the treadmill, and ABPI before and after treatment in each individual using a paired student *t* test. The HRQL and utility data were not symmetrically distributed and the difference before and after treatment was analyzed using the Wilcoxon signed ranks test. The association between HRQL measures, physical assessment measures and utility measures were analyzed with Spearman's rank correlation coefficient. A variable of a social and psychological nature is considered high if >0.70 for group comparison, but >0.80 is preferable, and for individual decision making the reliability coefficient should be >0.90 . Correlations between variable of psychosocial nature are often in a range of 0.10 to 0.40.²¹⁹

5 ETHICAL CONSIDERATIONS

The studies in this thesis followed the ethical principles of medical research involving human subjects outlined in the Helsinki Declaration²²⁰. According to one of the 24 basic principles for all medical research it is a duty for the researcher to protect life, health, dignity, integrity, right to self determination, and the privacy and confidentiality of personal information of research subjects.

All ethical aspects of the studies in this thesis were carefully considered with special attention given to maintain the patient's dignity, integrity and self determination by providing both verbal and written information about the voluntariness of the studies, and to clearly state that declining to take part would not affect their usual treatment at the department. The subjects were also informed about procedures such as coding systems and ensuring anonymity in publications to maintain confidentiality. Informed consent was given verbally by the participants.

In the interview study it was possible for the participants to choose the time and place for the interview.

Before conducting the studies a predication of possible risks, burdens and possible benefits was done in order to fulfill the principles to protect life and health. In the study involving the treadmill test (paper IV) precautions were taken in case any of the participants should experience adverse reactions to the physical efforts involved in the test with a possible need for medical attention. For the interview studies the time and effort that the participants had to take as well as possible reactions to the questions proposed were carefully considered. During the qualitative interview (paper II) the informants talked about their experiences, including thoughts and feelings. This situation could be seen as intrusive and attention was taken if any signs of reluctance to respond were seen. However, no negative responses were received at the time of the interview; instead, the informants expressed gratitude for getting the opportunity to talk about their experiences of the care pathway. Special consideration was also taken when asking the questions concerning a deadly risk and trading off years (paper III), which could potentially impose anxiety to the participants. All of these interviews were carried out with sensitivity to the respondent's need and abilities, and considerable time was spent explaining the procedure and method before conducting the interview. Before ending the interview the respondent was able to express their reactions to answering the hypothetical questions, and only one thought it had been difficult answering a hypothetical question.

All participants in the studies received written and verbal information about the aim of the studies and clarifications could be made during the informed consent procedure. All collection of patient data was done during a period where no possible dependent relationship existed between patient and researcher.

Approval to carry out the studies was given from the ethics committee at Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden (Dnr 95-172, 00-434, 03-186, 2007/756-31/2) as well as from the head of the Department of Vascular Surgery.

6 MAIN FINDINGS

6.1 PAPER I

There was a significant difference between the EG and CG both before and after surgery regarding psychological well-being, showing the EG being significantly more sad preoperatively ($p=0.004$) as well as postoperatively day 1 ($p=0.03$) and day 3 ($p=0.04$), but no significant differences were seen for appetite, nausea, sleep, physical ability or bowel function. No differences were seen in the degree to which the aneurysm had affected their life situation ($p=0.14$) and both groups rated their health status (HI) as rather good preoperatively.

Both groups rated decreased levels of psychological well-being during the first two days after leaving ICU. These levels increased after day three and remained rather stable for both groups until day seven. The EG rated worse psychological well-being during all days of measurement compared to the CG.

A decreased physical well-being after surgery with less appetite as well as sleep disturbances was reported in both groups. On day one the reported VAS score for appetite (the lower the worse appetite) was (median EG 1.5, CG 1.0) and for sleep (the higher the worse) was (median EG 7.0, CG 6.8). These disturbances remained below preoperative levels during the first week with both groups reporting the same levels last day of measurement.

A majority of the patients in both groups could stand by the bed on day one (EG $n=12$, CG $n=16$), but more patients in the CG reported to also be able to walk in the corridor with support (EG $n=1$, CG $n=6$). On day seven there were less patients in the EG who walked without support (EG $n=9$, CG $n=13$). On the last day of measurement there were still patients in both groups having problem managing daily activities as well as having diarrhoea.

There was a significant correlation between psychological well-being and aneurysm size preoperatively for the CG, showing the larger the aneurysm ($p=0.02$). There were also significant correlations between ICU days and psychological well-being in both groups, showing the longer time spent in ICU the sadder and tense.

In summary, EG reported being more sad compared to the CG both before and after surgery. Although no significant differences could be seen between the groups regarding the single item concerning the degree to which the aneurysm had affected their life situation, the CG reported a significant correlation between aneurysm size and feeling less hopeful before surgery. There were also significant correlations

between ICU and length of stay. Both groups were affected by surgery with less appetite and sleep disturbances as well as decreased physical ability.

6.2 PAPER II

The lived experience of the care pathway of going through open surgical treatment of AAA was interpreted in 14 themes described in the three phases of the care pathway: before surgery, during hospital stay and being at home.

In the “before surgery” phase, the main three themes were: *Living with a deadly threat awaiting surgery, Knowing the general but not specific risks with AAA surgery, and Confiding in the treatment decision but having no option to decline.*

During this phase the informants expressed being fully aware of the risk following an AAA rupture, which created distress while waiting for surgery and restricted daily life. Having an understanding of the risk associated with the disease did not mean having an understanding of the potential risk and complications associated with treatment. The informants apprehended the information from the surgeons to be more about general risks with surgery than the specific risks with OR. Overall, the preoperative information provided was considered insufficient, but at the same time they questioned their ability to perceive the information given at that point.

Having an awareness of the deadly risk with AAA meant having a feeling of not being able to decline surgery, and consequently, taking a chance with treatment. This affected the engagement of the patient in the treatment decision, which meant trusting the surgeon’s judgment.

The experience during hospital stay was interpreted in five themes: *Experience dependency and embarrassment due to unexpected complications and lack of control, Experiencing changes in taste sensations and loss of weight, Sleeping patterns being affected by the surgical experience, Lacking dialogue according to one’s needs, and Being worried about going home.*

Becoming dependent on help and support from the health care staff was difficult to cope with and caused embarrassment since the informants had not anticipated needing help with personal hygiene or having to wear diapers due to diarrhoea. It was also difficult to eat due to a loss of appetite, nausea and altered taste sensations, which meant losing a lot of weight.

After returning from the ICU it was difficult to have a clear head, described as being in a state between dream and reality, as well as having sleep disturbances, which was explained as being caused by having understood the risk and magnitude of surgery.

The informants expressed lacking an opportunity to take part in decisions concerning their treatment, and felt they had to actively seek information about test results. There was also little opportunity to talk about emotional reactions to surgery.

Before going home there were worries about the future, which included managing

everyday life as well as the healing process, and these worries could not be expressed to clinical staff because of the short length of time spent with the surgeon before discharge.

The experience of being at home was interpreted in five themes: *Adapting to health care staff and structure instead of personal needs at follow-up, Gradually understanding the magnitude and risks with treatment causes strong emotion, Experiencing remaining physical complications, Feeling unprepared to cope with everyday life and concerns from significant others, and Being alone with difficult experiences.*

After returning home the magnitude and risks associated with the surgery gradually became clearer and there were many thoughts of possible complications that could have happened, which affected their sleep. This situation created a need to talk about the experiences and concerns with the health care staff, but this need were not met at follow-up. The long recovery period, which the informants had not anticipated, further contributed to the understanding of the magnitude of surgery, and to having difficulties accepting their situation. This caused strong emotions which were difficult to control, and the target for venting these emotions was often their spouse.

Remaining physical problems such as altered taste sensations and an overwhelming fatigue, making it impossible to stay up for longer periods, was still a major problem at the time of the interview.

Being at home also meant worrying about managing everyday life and having to rely on significant others who may not have either the strength or ability to manage all the tasks in the household. It was also difficult to manage the concerns of the significant others, and not easy to talk about the surgical experience. Neither having had an opportunity to talk to the surgeon at the follow-up, nor being able to talk to their significant others, meant being alone with their experiences, and this caused distress.

In summary, there was a lack of information and dialogue during the care pathway, which contributed to feeling unprepared for the physical and emotional impact as well as the long recovery period. The need to talk about their experiences was not met, which created strong emotions which were difficult to cope with.

6.3 PAPER III

Risk attitude and preference values were significantly different between the age groups in the general population sample TTO ($p=0,05$) and SG ($p=0.001$), with the main difference found between the oldest age group compared to the younger age groups: age 50-59 (TTO $p=0.03$, SG $p<0.001$), age 60-69 (TTO $p=0.01$, SG $p<0.001$), age 70-79 (TTO $p=0.02$, SG $p<0.002$).

The reported SG values in the three younger age groups were significantly lower compared to the TTO values, indicating a preference to take a higher deadly risk with treatment than trading off years. This was not seen in the oldest age group. Results are presented in Table 5.

Table 5. Mean, SD, median and interquartile ranges for TTO and SG values in the general population sample (paper III)

	TOTAL SAMPLE mean (sd) md (q1-q3) ^a	AGE 50-59 mean (sd) md (q1-q3) ^a	AGE 60-69 mean (sd) md (q1-q3) ^a	AGE 70-79 mean (sd) md (q1-q3) ^a	AGE >80 mean (sd) md (q1-q3) ^a	P-value
TTO	0.88 (0.18) 1.0 (0.80-1.0)	0.90 (0.13) 1.0 (0.80-1.0)	0.86 (0.20) 1.0 (0.80-1.0)	0.86 (0.19) 1.0 (0.70-1.0)	0.92 (0.17) 1.0 (1.0-1.0)	0.05
SG	0.79 (0.22) 0.85 (0.60-1.0)	0.73 (0.17) 0.70 (0.60-0.86)	0.74 (0.26) 0.82 (0.50-1.0)	0.79 (0.22) 0.80 (0.58-1.0)	0.91 (0.18) 1.0 (1.0-1.0)	<0.001

^a Median value (25th and 75th percentile). Score 0 -1.0, a high score indicates full health, significant differences between age groups according to Kruskal-Wallis analysis

No significant differences were found in the reported preference values between the age groups with regard to previous knowledge of AAA, family situation or current diseases.

The derived TTO value in the patient group was mean 0.91 (SD 0.23), median 1.0 (q1-q3 1.0-1.0). This value was significantly higher than the TTO value reported in the three younger age groups, but similar to the oldest age group; age 50-59 (TTO p =0.03), age 60-69 (TTO p=0.001, age 70-79 (TTO p=0.02) and age > 80 (TTO p=0.91).

No association was seen between the TTO value reported by the patient group and the TTO and SG values reported in the population sample. There was a strong agreement between TTO and SG values reported by the different age groups, except for the youngest group: 50-59 ($r^s = 0.39$, $p = 0.01$), 60-69 ($r^s = 0.62$, $p = 0.001$), 70-79 ($r^s = 0.72$, $p = .001$) and >80 ($r^s = 0.93$, $p = 0.001$).

Overall, the oldest age group was not inclined to trade off years or take a deadly risk with treatment in the same degree as seen in the younger age groups. The oldest age group was also more consistent in their reported TTO and SG values compared to the younger age groups, who tended to be more reluctant to trade off years than take a deadly risk. When comparing the preference value between the patient group and the general population sample, the main differences was in the younger age groups who reported a lower TTO value.

6.4 PAPER IV

The reported TTO values showed that the patients equaled ten years in their current health state with seven years (median) without their walking limitations, and the SG values showed a willingness to take a deadly risk of 13% (median) with treatment. In the patient group, 66% were willing to trade off 2-8 years of the hypothetical 10 years of their remaining life, and 34% were accepting a deadly risk (SG) of 48-96% to be free from their symptoms.

There were weak but significant correlations between TTO and absolute claudication distance (ACD) measured on the treadmill ($r^s = 0.21$ $p=0.03$), EQ-5D mobility ($r^s = 0.20$ $p=0.04$) and WIQ pain ($r^s = 0.22$ $p=0.02$), showing a preference to trade off more years the more the problem with pain and walking distance. Patients were also reporting taking a lower deadly risk the higher the ABPI ($r^s = -0.32$ $p=0.01$).

There were no significant differences between direct elicited risk attitude and preference values pre- and postoperatively.

The UK EQ-5D Index value was significantly improved after treatment ($p < 0.001$) as well as EQ-5D VAS ($p=0.02$). The improvement of the index value corresponds to a QALY gain of mean 0.17. In the cost utility analysis the QALY gain was multiplied with a survival of 5 years to estimate cost effectiveness ($5 \times 0.17 = 0.85$). The ICER for endovascular treatment was 6500 US\$ ($5500/0.85$) and for bypass surgery 13 000 US\$ ($11\ 000/0.85$), which is considered to be cost effective.

After revascularization a significant improvement was seen for the clinical parameters ACD ($p \leq 0.001$) and ABPI ($p=0.003$) as well as for WIQ subjective pain, walking distance, speed and stairs, with a significance level in all four dimensions showing ($p \leq 0.001$).

Health status measured by the EQ-5D was significantly improved in the dimensions of mobility ($p < 0.001$), usual activity ($p=0.05$) and pain ($p=0.004$), and HRQL measured by SF-36 in the dimensions of physical functioning ($p < 0.001$), role-physical ($p=0.006$), bodily pain ($p=0.001$) and social functioning ($p=0.05$).

In conclusion, the patients who were willing to trade off years and take a deadly risk with treatment were prepared to shorten their life by 30% and take a deadly risk of 13% in order to live their remaining life without walking limitations, and further, the revascularization procedures could be considered cost effective, at least in the short-term.

7 DISCUSSION

7,1 GENERAL DISCUSSION OF THE FINDINGS

The findings of this thesis shows the complexity of the information process for patients with AAA facing OR, and the immense physical and emotional impact of disease and treatment during the care pathway, indicating a need for nursing care as well as support from the entire health care team. It also indicates that the patients and the vascular surgeons risk attitude and preferences is not always in concert. Among a general population sample, mainly the elderly (>80 years), were reluctant to undergo major surgery and were prepared to deny proposed operation. On the other hand patients with severe IC were more willing to take risks in order to regain walking capability.

Experience of information, well-being and care pathway in patients with AAA

The additional written information given on the day of admission seemed not to have the beneficial effect on physical and psychological well-being as has been previously hypothesized (paper I). Instead, the EG was significantly more sad postoperatively, and showed a tendency to feel less hopeful and tense on day seven. A possible explanation for the decreased psychological well-being might be that the information in the booklet had caused worries that needed to be discussed with the health care staff. The routine at the time of the study did not offer such an opportunity, and the time between admission and surgery was short with little or no possibility for a dialogue.

Having little chance to talk about any concerns or emotional reactions following the receipt of information is not only restricted to the period before surgery. The narrative in paper II gave information about lacking a dialogue both before and after surgery, and further, having the need to talk about emotional reactions and not just the physical problems following OR. The decreased levels of psychological well-being during the first two days after returning from ICU in both the EG and the CG (paper I) may be a reflection of this need.

Even if the written information could cause worries, the narrative in paper II revealed an immense need for more knowledge about the disease and its treatment, even after receiving both verbal and written information. At the same time, however, the ability to perceive this information was questioned by the patients. One factor influencing this ability may be the distress caused by being aware of the deadly risk associated with a possible rupture of an AAA, and therefore having no choice other than to undergo surgery. The overall feeling was that the patient had to take a chance with surgery in order to survive. This notion also affected the ability

to engage in the treatment decision, and thus led to having to trust the judgment of the surgeon. Being emotionally affected by getting an AAA diagnosis has previously been shown^{2,221}, and also the awareness of the lethal threat to life³⁰.

To have to cognitively manage a lot of information during a short and stressful time period before surgery with few opportunities before or after treatment to discuss any questions or concerns, may have contributed to both the apprehension of not receiving sufficient information (paper II) as well as to the impaired psychological well-being (paper I) and the emotional reactions postoperatively (paper II). The evidence on the benefits of preoperative information is not clear, and the need for more rigorous research identifying the optimum timing and method to deliver this information has been suggested²²². When planning education for patients with AAA the results from the studies in this thesis suggest that an opportunity for the patient to discuss any concerns with the health care staff should be offered both before and after surgery. The need to discuss written information and get advice and guidance from the clinician has also been shown in a study of men identified with a small AAA in a screening program²²³.

Beyond the information needs and the emotional impact seen in patients with AAA treated with OR, the vast physical impact of surgery is also evident. The results from papers I and II confirm previous studies reporting on the decreased physical functioning seen both during the immediate period after surgery as well as up to three months postoperatively^{31,69}.

In paper I, the decreased ability to walk without support and handle personal hygiene was seen in both groups during the first three days at the surgical ward. Bowel function was not returning to normal function until day three, and on day seven some patients still reported problems with diarrhoea and walking without support. Throughout the follow-up period both appetite and sleep were negatively affected. Similar experiences were seen in the narratives (paper II), where problems with sleep, appetite, altered taste sensations and loss of weight were experienced during the hospital stay. Furthermore, the problem with diarrhoea caused feelings of embarrassment when having trouble getting to the toilet in time, and being forced to wear diapers. It was also difficult becoming dependent on support from the health care staff, especially with regard to personal hygiene.

Losing a lot of weight due to a loss of appetite was considered a problem (paper II) which has been reported previously by Deeny & Kirk-Smith 2000 and Zalon 2004. Deteriorated nutritional status is likely to increase fatigue and thus negatively affect functional status. In the study by Zalon 2004 on the recovery of older adults after major abdominal surgery, it was shown that functional status was most decreased during hospital stay, and that there was a strong association between decreased functional status and pain, depression and fatigue.

The sleep disturbances found in both groups (paper I) was also seen in the narratives (paper II) where the patients described having their sleep affected by nightmares and unpleasant feelings of being between dream and reality during the period after returning from the ICU. It was also at this point when the degree and risk associated with surgery was realised for the first time, leading to many thoughts about possible consequences that could have happened. The immense information need, together with the knowledge gap concerning the specific risks with AAA surgery, probably decreased the ability to achieve understanding of the magnitude of OR before treatment, which may be why this insight came later. The period after returning from the ICU is a critical point for the patients and the need for a dialogue at this point should be assessed by the health-care team.

Not fully understanding the preoperative information as well as being emotionally affected during the initial days after surgery was also seen in the studies by Deeny & Kirk-Smith 2000 and Zalon 2004.

These results (paper I and II) confirm the immense need for support from the health care team during the hospital stay and the importance of early identification of problems in the impaired areas in order to promote recovery.

Before being discharged the patients worried about the healing process and how to manage everyday life at home (paper II). These fears were not addressed by the health care staff by using well-structured discharge information. Instead, the information was often delivered during rounds, with little opportunity for the patient to ask questions. The need to recognize, prevent and manage possible complications has previously been shown to be important for patients with AAA to enable them to manage their self-care⁶⁹, a fact that should be considered by the health care staff. Other studies on discharge information have shown that information should focus on individual health needs contextualized to the specific situation and should also assess the learning needs during different phases of the care pathway²²⁴⁻²²⁶. The evidence is limited concerning the benefits of different discharge interventions²²⁷, and how to design the best interventions for patients with AAA needs further study. In the meantime, nurses and vascular surgeons should sum up the care episode and offer the patient an opportunity to talk about experiences and concerns about the future before discharge. In this way potential needs could be identified and met and thus facilitate self-care and promote realistic expectations about the recovery period.

The narratives in paper II gave information about the difficulties that were faced when being at home. The magnitude of the surgery and the effect it had on daily life were still a major concern occupying the patients' thoughts. Factors contributing to the difficulty of adapting to the situation were remaining physical problems, such as major fatigue and loss of appetite, and an unanticipated long recovery period. There was an overall feeling of having been lucky to survive, which was difficult to cope with when thinking of the deadly risks associated with surgery at the same time. Altogether this affected sleep negatively, which caused strong emotions which were hard to control. Spouses or significant other were often the target for releasing emotions such as frustration and anger. Fatigue and sleep disturbances have previously been reported to be the most distressing symptoms after discharge for patients who underwent OR ⁶⁹.

Feeling alone with the difficult experiences following surgery was another problem after discharge (paper II). The patients felt uneasy about talking with spouses or significant others about their experiences, and they did not get an opportunity to discuss any physical and emotional reactions with the surgeon during follow-up.

Not being prepared for the complications or the long recovery is probably an overall effect of lacking both information and dialogue during the care pathway. It is important to incorporate current evidence regarding the impact on HRQL, both in the short- and long-term following OR ^{8,63-65} to provide accurate expectations of the recovery period.

The process of being diagnosed with AAA and the ability to understand the following information, as well as coping with the recovery period after OR is an immense challenge for the patients, and this transition can be difficult. Transition is a multi-faceted concept, which embraces process, time-span, and perception, and the transition has been defined as a passage or movement from one condition, state or place to another ^{32,228-230}. The findings in paper I and II reveal some important phases when the need for support and care are great, and special attention should be paid to the need for information and dialogue after: (1) receiving diagnosis and facing treatment, 2) during hospital stay, especially during the initial days after returning from ICU when both the physical and emotional needs are great, and (3) before discharge in order to prepare the patients for the recovery period. Furthermore, it is also important to allow the patients to narrate about their experiences and possible needs during follow up to facilitate the healing process. Recognizing information and support needs for the changes in life-circumstances can facilitate the recovery process following OR and thus promote the transition process from sickness to health.

Risk attitude and preference for treatment of AAA

The morbidity and mortality with OR as well as the impact on functional ability both in the short- and long-term has to be considered before taking a decision to treat. Since the decision involves a deadly risk regardless of treatment alternative, that is, declining treatment or accepting surgery, it is crucial to include the patient in the process.

The results from paper III show differences between age groups regarding risk attitude to OR. There were significant differences between the oldest age groups (>80) and the three younger age groups in the general population sample, suggesting that the oldest age groups were neither prepared to take a deadly risk (SG) with OR, nor trade off years (TTO) to live their remaining life without the risk of rupture in the same extent as the younger age groups. The result for TTO was similar between the patient group and the oldest age group, but differed significantly for the younger age groups. However, the findings for the patient group have to be treated with caution, since this is a derived value of risk attitude, and not directly elicited. Furthermore, it is not in accordance with other studies using a derived TTO value in patients with AAA^{1,55}, with a higher TTO value in our study suggesting a lesser risk attitude. But a review on utilities in AAA has shown that the result differs considerably depending on the technique used²⁴.

There were little differences between taking a deadly risk and trading off years in the oldest age group, while the differences were greater for the younger age groups. This result suggests that the younger age groups were more willing to take a deadly risk than to trade off years, which is in accordance with the study of a group of patients with small AAA under ultrasound surveillance (Winterborn). The result for the youngest age group (50-59) is similar to TTO and SG values reported in a study on preferences in patients with cerebral aneurysm²³¹.

The result for the oldest age groups may have been influenced by the time horizon, which could be considered unrealistic for older individuals¹⁶¹, and further, the description given on the risks associated with treatment and the impact on HRQL may also have played a role. A study on preference between OR and EVAR in patients identified with an AAA in a screening program showed that the oldest men were least likely to express a clear preference for either treatment, but when stating a preference, great emphasis was placed on factors such as shorter hospital stays and avoiding intensive care²²³.

The result from the general population sample is in accordance with a study presenting a hypothetical scenario for cerebral aneurysm²³². Characteristics such as current diseases, family situation or previous knowledge of AAA did not influence risk attitude, which agrees with the result found by King et al. 2005, who also concluded that education levels had no impact on preference.

The findings in paper III suggest that age could influence a person's preference, especially when facing a scenario involving a deadly risk with treatment and its consequences on daily life, which should be considered in decision making. It is also possible that the provision of more detailed information about the risk and possible consequences of treatment will influence patients' choice. In the study by Reise et al. 2009, it was shown that a majority of the patients with AAA appreciated the information pack that had been given prior to the measurement of preference. And further, they concluded that this information had been helpful in supporting their decision and their desire to express an informed preference. It is a possibility that the patients in the EG (paper I) would have stated a preference for treatment different to the one suggested by the surgeons if they had been asked.

Risk attitude and HRQL in patients with severe IC

The risk attitude and preference for treatment in patients with severe IC (paper IV) differed greatly from the preference seen in the patient group with AAA as well as from the different age groups in the general population sample (paper III) showing lower values, both for TTO, SG and UK EQ-5D Index, indicating a high preference for treatment. There were great variations in the TTO and SG values, with patients willing to trade off between 2 to 8 years (TTO) of their hypothetical remaining ten years, and taking a deadly risk of 48% to 96% (SG) in order to be free from their walking limitations. The age differences seen in the hypothetical scenario in paper III could not be seen among the patients with IC in paper IV, instead the great variations were probably a reflection of the underlying risk attitude, as well as the impact on HRQL.

The TTO and SG values were lower than been reported earlier for IC patients, but the EQ-5D Index value was similar¹⁹³.

There were significant but weak associations between walking ability and preference values, showing that the patients were prepared to take a higher risk with treatment and trade off more years the worse the pain and walking ability. Overall, these patients report having more impaired HRQL and functional ability compared to similar age groups in the Swedish population^{176,192}.

Health status measured with EQ-5D showed that a majority of the patients reported moderate problems in the dimensions of mobility and moderate to severe problem for pain, with both dimensions improving significantly with treatment. This result is in accordance with other studies on patients with IC^{133,193}. Walking ability measured with WIQ also showed impairments in all dimensions, with postoperative improvements. The preoperative impairments are similar to previously reported WIQ results in IC patients²³³.

HRQL measured with SF-36 was mainly reduced in the dimensions of physical functioning, role-physical, bodily pain and social functioning, with all values

significantly improved by treatment. These results are in agreement with other studies in this patient group^{13,104,134}.

When trying to interpret the result regarding risk attitude and preferences for treatment, it seems that preferences are affected by symptom severity (paper IV) and age (paper III), but these findings have to be considered with caution, as they need further studies with larger samples. The evidence regarding preference values are not consistent, showing great variations for possible factors influencing a person's risk attitude (Dolan 2002, Prosser 2007, Rosen 2003, Tsuchiya 2005). Some explanations for these differences are the diversity of the methods used to elicit preference, how risks are presented and the amount of information given prior to the task²³⁴⁻²³⁶. With these conflicting results in mind, the result from papers III and IV can give additional information to enhance knowledge in this field.

Cost utility analysis

To assess the cost-effectiveness of surgical treatment of severe IC (paper IV), the result from the UK EQ-5D Index was used for QALY calculations. The analysis was based on a long-term survival of five years, and cost effectiveness was assessed from a hospital perspective, including only the cost per patient for endovascular treatment and open bypass surgery. The analysis showed a QALY gain of treatment resulting in an ICER below the threshold suggested by NICE. This proposes that treatment of patients with severe IC is cost effective. The analysis did not consider that societal perspective and the time for follow-up was short, meaning that the results must be considered with caution. It has been shown previously that endovascular treatment is more cost effective than open bypass surgery or exercise therapy²³⁷.

7.2 METHODOLOGICAL CONSIDERATIONS

With the previously described purposes of these studies there are some methodological considerations that have to be considered regarding internal and external validity. Special attention in the quantitative studies should be placed on *internal validity*, meaning the extent of other factors than the intervention, such as selection bias or losses between treatment groups, influencing any changes or group differences. The *external validity* refers to the extent to which the results can be generalized outside the study settings^{213,238}.

In the qualitative study the methodological considerations refer to trustworthiness in the form of *credibility* which, for example, refers to confidence in how well data and processes of analysis address the intended focus and data collection.

Dependability refers to the degree to which data changes over time and alterations during analysis made by the researcher, *Confirmability* refers to the risk of interview bias, and finally, *transferability* addresses how well the result can fit other groups or settings^{216,219,239}.

Internal validity

Systematic errors such as selection bias were limited by including all eligible patients planned for OR consecutively in the study (paper I). One possible bias with this inclusion criterion is getting a mix of patients with varying time periods awaiting surgery, which may limit the inferences of the result. Certain patients may have been monitored by ultrasound for a longer period before surgery and therefore have had the opportunity to seek knowledge about the disease as well as adjust to their situation. Exclusion of patients could also affect the result, and the reason for the exclusion criteria of a prolonged stay at the ICU was based on the assumption that these patients would probably experience medical complications affecting their physical and psychological well-being to such an extent that the effect of the information would be difficult to assess. Since this group was estimated to be small, further analysis to control for these factors was not considered feasible. This means that the result for the physical ability and psychological well-being may be more positive than if all patients were included.

The reason for not including patients with previous experience of surgery for severe IC (paper IV) was based on the possible effects it could have on risk attitude and preference for surgery, which has previously been shown^{240,241} and thus would bias the result.

Collecting data retrospectively from a registry (paper III) could increase the risk for selection bias, but this risk could be considered small since the nationwide registry used for data collection has shown high internal and external validity with a coverage of >90% of AAA procedures performed in the country²⁴².

Another threat to internal validity is the time for follow-up which could influence the result. The assessment of HRQL after six months in patients with severe IC (paper IV) could have been influenced by possible deteriorations of their vascular disease and thus affect the result more negatively, but since these patients showed significant improvements in both HRQL and walking ability, similar to other studies on patients with IC, a further increase should be minor.

There was a risk of getting familiar with the test used both pre- and postoperatively (paper I and IV), and thus affect the result other than the intervention. In paper I, data collection was repeated every day for one week, making the respondent familiar with the scales used, and this may have been reflected in the low variability after day three for psychological well-being. On the other hand, the variation in the scores for appetite was larger, indicating that the patients considered each assessment on the basis of their current situation, giving validity to the result. The pre- and post test design used to assess HRQL, risk attitude and preference (paper IV) could also have been influenced by a familiarity of the questions used, but the variation for both HRQL and the preference values were in the expected directions, indicating a robust result.

The attrition rate was high after OR (paper I), and bias cannot be ruled out. The excluded patients were either medically unfit for surgery or had experienced serious complications, indicating that these patients were probably in a worse medical state compared to the included patients. This means that the result may give a more positive view of the impact of surgery.

Construct validity

To avoid bias due to confounders, demographic data was collected from the medical records and stratification, as well as strict inclusion criteria, was used (paper I, III and IV). In papers I, III and IV, information was not gathered about educational level, which could be a confounder, and thus affect the inferences of the result. However, the patients in papers I and IV were recruited from a geographic area with similar socio-demographics. The general population sample was recruited from Stockholm County, and the education level could be anticipated to vary. But it has been shown in studies using preference measure that educational level does not significantly affect the result^{243,244}, and therefore this factor would have minor effect on the result.

Conclusion validity

The sample size in study I was small and not based on a formal sample size calculation, which increased the possibility for a Type I (α) and Type II (β) error. The risk of rejecting the null hypothesis when it is in fact true (Type I error) was handled using a significance level of 5%, although there was still a risk for Type I

error due to the use of multiple testing, because this can invalidate the result of the hypotheses test, and one way to avoid this is using a cut-off level of significance of 1%. It is suggested that the outcome measures of major interest should be decided before the analyses, and any other variables with interesting findings should be interpreted cautiously and seen as secondary variables. In paper I the significant result showing for the association between different variables must therefore be interpreted with this in mind.

A major risk of Type II error, that is accepting the null hypothesis when it is actually false, is major when the sample size is small. One way to reduce this risk is to calculate a sample size based on a predefined power of 80 to 90% and significance level of 1 to 5% in order to detect a real difference²³⁸. Because of the small sample size the inferences of the results are limited.

Responsiveness to measure can be considered by its ceiling and floor effect, that is the proportion of patients who achieved the highest or the lowest possible scores, which can be a problem in patients with either mild or severe symptoms. One way to overcome this threat is to use a larger sample.

The result from EQ-5D (paper III) indicates a ceiling effect, which may reflect the inappropriateness of using this instrument in a patient group with no explicit symptoms of their disease, but it may also be an effect of the small sample.

VAS scales have a tendency to cluster at either end or in the middle. It is also suggested that VAS scales are more difficult for elderly people to use. The findings in paper I indicate a valid result with a clinically relevant variation over time. To overcome any difficulties with the VAS scales, one of the researchers assisted during all assessments.

When using the TTO and SG question the measures are traditionally anchored with dead and perfect health. When the focus is to elicit a preference for a specific disease or condition an alternative to the upper anchor of perfect health can be used, which is disease-free. This is used when the individual or patient has other diseases or conditions that contribute to their imperfect health. In this study we used the upper anchor of disease-free that is not having impaired walking or being free from the risk of an AAA rupture, to explicitly measure the burden of the particular disease of interest. It has been reported that the use of a disease-free upper anchor can result in higher utility values compared to utilities measured with a perfect health anchor. This is important to consider when interpreting and comparing the result with other studies.

External validity

The result from the studies included in this thesis has to be considered in terms of generalizability to other settings or samples. Threats to external validity are, for example, characteristics of the sample as well as the environment or research situation²¹⁹.

The inclusion of patients in the studies (paper I, III and IV) were not restricted with regard to other diseases which make them representative of these patient groups, but as we used questionnaires and interview technique this demanded participants with no communication problems and able to speak and understand Swedish. The rate of excluded patients in paper I due to a prolonged stay at the ICU must be considered and the results are only valid for patients with an ICU stay < 3 days. In paper IV the group consisted of patients without any history of endovascular treatment or open surgery, and the result is therefore only representative for this group and cannot be generalized to patients treated several times for severe IC or critically ischemic patients. In paper III the patient group was a sample from a few centers, which could affect the representation of the result and this must be kept in mind.

The Hawthorne effect refers to the way a subject can behave because of being aware of participating in a study. This effect may have been present when eliciting risk attitude (paper III and IV) since this assessment is not part of the normal procedure, which is important to consider. The interaction of history and treatment effects is considered to be low, using a time window of seven days (paper I) and six months (paper IV).

Trustworthiness

In the qualitative study (Paper II) trustworthiness is considered using other terms than validity, reliability and generalizability. Instead credibility, dependability and transferability are used.

Credibility

Credibility addresses the focus of the study, its context, the participants and the approach to gathering data ²¹⁹. In this study the focus was to illuminate the experience of going through the care pathway of OR, and thus patients with various perspectives of the care pathway were approached in order to achieve as broad and varied a description as possible. The interviewer had experience of the context, which may have contributed to a situation where the respondents felt more at ease talking about their experiences, and the interviewer could also be sensitive to their needs and abilities. To further contribute to a comfortable situation, all respondents could choose the time and place for the interview.

The time used for each interview was not predetermined in order to fulfill preconditions for reliable data collection. All interviews were performed during a period of one month by the same interviewer, and the procedure was therefore similar each time. The short time between interviews allowed the interviewer to judge when the same information was provided by more than one informant, and therefore the amount of data could be considered sufficient to answer the research question.

All interviews were conducted three months after OR, based on the result of HRQL

studies showing the likelihood of having returned to preoperative levels at that time. Using data collection retrospectively increases the risk of recall bias. However, experience of such major surgery as OR involving both risk of morbidity and mortality should reduce this risk.

Credibility also refers to how well themes cover data and also how to judge similarities within and differences between categories or sub-themes. This was performed by seeking agreement about themes among co-researchers who have not had experience within the field of vascular surgery as well as using quotations from the transcribed text.

Dependability

Dependability refers to the degree to which data change over time and to alterations made in the researcher's decisions during the analysis process²³⁹. Data collection was not extended over a long period and thus allowed a consistency during data collection. All interviews were narrative, but also combined with an interview guide covering areas of interest. This approach further contributed to consistency during data collection. Three researchers were involved in analyzing the data using an open dialogue regarding similarities and differences during analysis. As two of the researchers did not have the same intimate experience of these patients, this allowed for new insights to emerge.

Confirmability

Confirmability was achieved by considering the pre-understanding of the interviewer both during the interview and during analysis. The analysis was conducted by using co-researchers within other nursing fields, and the possible effects of having a pre-understanding was discussed during all steps of the analysis.

Transferability

Transferability refers to the extent to which findings can be transferred to other settings or groups²¹⁹. It is valuable to give a clear and distinct description of context, participants' characteristics, data collection and process of analysis. The presentation of the result should be rich and vigorous and quotations should be used²¹⁶. The context and characteristics of the participants has been described to enhance transferability, and a purposive sampling technique was used to gather information from different perspectives and in this study both patients who had experienced complications and who had no complications during their hospital stay were included. After ethical approval was granted, patients fulfilling the inclusion criteria of going through OR three months earlier were consecutively contacted and included in the study allowing the sample to be representative.

7,3 CLINICAL IMPLICATIONS

Preoperative information should be organized in a way that is considerate of the individual patient's needs, and allows a better understanding of the potential risks, complications and impact on HRQL following treatment, as well as enhances the possibilities for the health care staff to identify any questions or concerns that may be caused by the information. If these conditions are fulfilled, the likelihood that the patients will have accurate expectations of the rehabilitation process increases, which could facilitate the patient's recovery.

Identifying the patient's need for information during the care pathway is an important prerequisite for participation and dialogue concerning treatment and care, which has to be considered by vascular surgeons and nurses. The immense physical and emotional needs following OR, have to be assessed using an ongoing dialogue with the patient in order to relieve symptoms and enhance patients' coping skills during the care pathway. Before discharge the patients should be given a summary of the care episode in order to facilitate the adaptation process of going through OR. Furthermore, information about wound healing, the rehabilitation process and possible complications should be presented in order to decrease worries during the recovery period.

The need to discuss remaining physical complications and emotional reaction should be considered at follow-up, which could include a nurse visit or follow-up by telephone.

It seems reasonable to assume that a share of our elderly patients would hesitate or deny OR if having received understandable information about the disease, its natural course, risks and efforts with operation. Likewise it seems that a conservative attitude in treating patients with severe IC needs to be revisited and replaced by a more aggressive and active approach considering the patients experience of their disability and their willingness to take risks in order to be relieved from it.

It is important for the vascular surgeon to include the patient in decision making, and thus consider patients' preference for treatment. To facilitate this process, the information about the risk-benefit scenario should be adjusted to the individual patient and presented in a way that enhances participation. The methods used in this thesis to elicit preference may be one way to assist the patient and surgeon in this process, but most importantly, to ensure that a comprehensible and structured method are used.

8 CONCLUSIONS

The provision of a combination of written and verbal information to patients with AAA prior to open repair to enhance postoperative mobilization was concluded not to have any beneficial effect on physical and psychological well-being. Instead, the written information seemed to cause decreased levels of psychological well-being.

The physical and emotional impact following OR is immense, both in the short- and long-term, and to facilitate the transition process the patients need accurate expectations of the rehabilitation process, opportunities to express health needs and to participate in clinical decision-making concerning their care throughout the care pathway.

Older age can be a predictor of less preference for OR when being presented with the risks and complications with treatment and the impact on HRQL.

Patient's preference for treatment of severe IC is associated with symptom severity, with a willingness to take considerable risk with treatment and trade off years of their remaining life in order to be free from their symptoms.

Treatment of severe IC could be considered cost-effective in the short-term from the hospital perspective.

9 FURTHER RESEARCH

The results in these studies show the importance of conducting larger studies with better statistical power to detect any effects of information given prior to surgery. It is also important to further study the time point, content and method used for patient education to enhance patient participation in decisions concerning treatment and care.

Risk attitude in patients with AAA who are facing OR or endovascular treatment is also an important area for further study. With the introduction of a screening program in Sweden, this could open up new opportunities for these kinds of studies, which previously have been considered ethically difficult. Increased knowledge in this area could help the surgeon guiding the patient in the medical decision process. Furthermore, studies regarding the best method to elicit preference could give important information in finding a tool that could be used in clinical practice.

Both quantitative and qualitative studies are needed to fully understand the physical and emotional impact of AAA treatment, both in the short- and long-term, to develop evidence-based clinical guidelines ensuring high quality care of these patients.

The cost-effectiveness of treatment of severe IC should be studied from a societal perspective using a life time horizon, and further studies should also focus on the best method to elicit preference values for use in QALY calculations to estimate cost effectiveness in patients treated for IC and AAA. This could give valuable information about which method is best reflecting disease and treatment effects.

10 POPULÄRVETENSKAPLIG SAMMANFATTNING

10.1 BAKGRUND

Inom kärnkirurgin ställs ofta patient och läkare inför svåra avvägningar mellan risk med sjukdomens naturalförlopp och risker/vinster med behandlingen. Exempel är pulsåderbräck på stora kroppspulsådern (bukaorta aneurysm=BAA). BAA ger sällan symtom och när det ökar i diameter (>5cm) ökar risken för att det spricker. Om detta inträffar dör nästan 80 %, men risken för att det spricker är i det individuella fallet mycket svårt att fastställa. Vid en planerad förebyggande operation dör i genomsnitt 5 % och lika många drabbas av andra allvarliga komplikationer. Operationen är stor och efterförloppet är ofta mycket ansträngande för patienten som i regel har en hög ålder och andra allvarliga komplicerande sjukdomar. Det är viktigt med information till patienten inför ett så viktigt beslut. Studierna i denna avhandling visar att tillägg av skriftlig information bl.a. innehållande risker med operation för BAA skapar en befogad oro hos patienterna. Återhämtningen efter operationen påverkades inte av denna information. Vid en djupintervju med 10 patienter som genomgått planerad operation av pulsåderbräck framkom det att patienterna inte hade förstått riskerna och komplikationerna förknippade med operationen. Inte heller var de förberedda på den fysiska och emotionella påfrestningen under rehabiliteringsperioden, vilket blev svårt att hantera. Ett uttalat omvårdnadsbehov och önskan att vara delaktig i vård och behandling identifierades samt möjlighet att föra en kontinuerlig dialog under hela vårdförloppet med sjukvårdspersonalen.

När man ställer 200 individer från befolkningen indelade i fyra åldersgrupper inför ett hypotetiskt scenario av att ha ett stort BAA som kräver operation så är den äldsta åldersgruppen (>80 år) tveksamma till att ta riskerna med operation.

Vid fönstertittarsjuka (IC), som innebär att patienten har stopp i pulsåderna till benen med åtföljande gångsvårigheter, är den vanliga inställningen bland kärnkirurgerna att man primärt inte ska ta riskerna med en operation utan i stället rekommendera rökstopp, gångträning och mediciner. Dessa patienter hamnar ofta i en ond cirkel genom att de har svårt att genomföra den så viktiga gångträningen som i sig påverkar andra sjukdomar som bidrar till en försämring av blodcirkulationen som t.ex. diabetes, hjärt-kärlsjukdomar och höga blodfetter. Patienter med svår IC (gångsträcka <200 m) har i studien visat ett annat förhållningssätt till operation än kirurgen. De är beredda att ta väsentliga risker med behandling för att bli fri från sitt handikapp och därigenom en ökad livskvalitet. Resultaten från studien talar för att man i många fall ska vara tidigare ute med aktiv kärnkirurgisk/endovaskulär behandling än vad som är vanligt idag för att påskynda

patientens möjligheter att fullfölja ett effektivt behandlingsprogram för hela sitt sjukdomskomplex.

Valet av behandling påverkas alltså av flera faktorer och vikten av att patienten ges möjlighet att delta i ett behandlingsbeslut bör understrykas. Eftersom livssituationen är individuell och påverkan på livskvalitet subjektiv måste, om möjligt, hänsyn tas till patientens önskan kring behandling.

Få studier har undersökt patientens upplevelse och preferens i samband med behandling av BAA och svår IC och det finns ett stort behov av ytterligare kunskap inom detta område.

Syftet med denna avhandling var att undersöka informationens betydelse för rehabilitering samt beskriva patientens upplevelse av vårdförloppet i samband med behandling av BAA. Dessutom beskriva riskbenägenhet och preferens för behandling av BAA och svår IC, samt kostnadseffektivitet.

10.2 PATIENTER OCH METODER

Avhandlingen består av tre kvantitativa och ett kvalitativt delarbete för att få en bredare bild av patientens upplevelse i samband med vård och behandling.

Studierna har inkluderat patienter behandlade på kärnkirurgisk avdelning samt en utvald åldersindelad grupp från befolkningen i Stockholms län.

Urvalet består av 37 patienter med BAA planerade för öppen aortakirurgi indelade i en interventionsgrupp och en kontrollgrupp för att studera effekten av en skriftlig broschyr på fysisk och psykologiskt välbefinnande under den första veckan på vårdavdelning efter öppen bukkirurgi (studie I), 10 patienter med BAA som genomgått öppen aortakirurgi intervjuades tre månader efter behandling kring sina upplevelser av vårdförloppet (studie II), 200 individer från en population i Stockholm indelad i fyra åldersgrupper samt 62 patienter med BAA planerade för behandling registrerade i det kärnkirurgiska kvalitetsregistret SWEDVASC (studie III) samt 50 patienter med svår IC studerades före och sex månader efter behandling avseende livskvalitet, riskbenägenhet och preferens för behandling samt kostnadseffektivitet (studie IV).

Data har insamlats genom enkät, intervju, fysisk funktionsmätning, journalgranskning och register. De enkäter och index som använts är Hälso Index (HI), SF-36, WIQ, EQ-5D, UK EQ-5D Index samt ett frågeformulär utvecklad specifikt för studien. Intervju genomfördes genom djupintervju och specifika intervjufrågor s.k. time trade-off (TTO) och standard gamble (SG).

10.3 RESULTAT

Delarbete I

Resultatet från det studiespecifika frågeformuläret visade inga signifikanta skillnader mellan grupperna gällande fysisk funktionsförmåga, tarmfunktion, sömn, aptit eller illamående under den första veckan på vårdavdelningen. Däremot skilde sig grupperna åt avseende psykologiskt välbefinnande. Patienterna i interventionsgruppen skattade sig mer ledsna dag ett ($p=0,004$) och dag tre (0,03). Det fanns ett signifikant samband mellan antal intensivvårdsdagar (IVA) och nedsatt psykologiskt välbefinnande i båda grupperna som visade att ju längre vårdtid på IVA desto mer ledsen och spänd var patienterna. Omvårdnadsbehovet under de första dagarna på vårdavdelningen var stort i båda grupperna med svårigheter att röra sig i korridoren utan stöd samt klara sitt dagliga liv. Dessutom rapporterade patienterna problem med sömn aptit och diarréer under hela mätperioden.

Delarbete II

Upplevelsen av att genomgå öppen kirurgisk behandling för BAA tolkades i 14 huvudteman, beskrivna i tre faser av vårdförloppet; före operation, på vårdavdelningen och att komma hem.

De tre huvudteman som beskriver tiden före operation var:

Leva med ett dödligt hot i väntan på behandling, Känna till de allmänna riskerna i samband med kirurgi men inte de specifika för öppen bukkirurgi samt Ha tillit till behandlingsbeslutet men inte känna ett val att avstå.

Patienterna var medvetna om risken att förblöda om pulsåderbråcket skulle brista, vilket skapade oro och en begränsning i det dagliga livet under väntetiden. Att förstå risken med sjukdomen innebar svårigheter att se något annat alternativ än att genomföra aortakirurgi, vilket uttrycktes som att man var tvungen att ta en chans med behandling. Detta påverkade engagemanget att delta i en diskussion kring behandling. Istället förlitade man sig på den medicinska bedömningen och överlämnade därmed beslutet till kärnkirurgen. Patienterna hade inte till fullo uppfattat de specifika riskerna eller komplikationerna som var förknippade med aortakirurgi eller förstått den stora omställning som operationen skulle innebära. Överhuvudtaget uppfattades den preoperativa informationen otillräcklig, men samtidigt ifrågasattes den egna förmågan att ta till sig all information innan behandling.

De fem huvudteman som beskriver patientens upplevelse av vårdtiden på avdelningen var:

Uppleva beroende och genans på grund av oväntade komplikationer och brist på kontroll, Uppleva smakförändringar och viktörlust, Sömnpåverkan på grund av erfarenheter av det kirurgiska ingreppet, Sakna en dialog som utgår från de egna behoven samt Oroa sig inför hemgång.

Att behöva hjälp med personlig hygien och uppleva komplikationer i form av diarréer som innebar ett behov av att bära blöjor, skapade känslor av beroende och genans. Omvårdnadsbehovet var stort och vanliga problem var nedsatt aptit, illamående, smakförändringar med stor vikt förlust som följd. Under dagarna efter återkomsten från intensivvårdsavdelningen uppfattades tillvaron oklar. Den beskrevs som att vara mellan dröm och verklighet, med svårigheter att sova. Sömnsvårigheterna förklarades av de många tankarna kring operationen och hur omfattande den varit. Både den fysiska och emotionella påverkan av aortakirurgin skapade ett behov av att tala om sina upplevelser, men det behovet blev inte mött. Under vårdtiden upplevdes även en brist på information om vård och behandling samt en liten möjlighet att vara delaktig i vårdbeslut. Innan utskrivning från avdelningen fanns en oro inför framtiden som inkluderade läkningsprocessen och möjligheten att klara det dagliga livet hemma. Det fanns liten möjlighet att tala om denna oro med läkaren eftersom utskrivningssamtalet upplevdes för kort.

Upplevelsen av att vara hemma tolkades i fem huvudteman:

Anpassa sig till sjukvårdspersonalen och organisationen istället för personliga behov i samband med återbesöket på mottagningen, Successivt förstå omfattningen och riskerna med operationen skapar starka känslor, Uppleva kvarstående fysiska komplikationer, Känna sig oförberedd på att hantera det dagliga livet och oro från närstående samt Vara ensam med svåra erfarenheter.

Vid hemkomsten fortsatte tankarna och funderingarna kring omfattningen med operationen och gradvis blev det tydligare vilka risker de varit utsatta för. En bidragande orsak till denna insikt var svårigheterna att återhämta sig. Detta påverkade sömnen negativt med behov av att prata om sina erfarenheter med läkaren i samband med återbesöket på mottagningen. Detta behov blev inte mött utan fokus låg på den fysiska undersökningen. Den bristande dialogen med läkaren och svårigheterna att tala om sina upplevelser med närstående gjorde att patienterna blev ensam med sina svåra erfarenheter.

Problem som fortfarande upplevdes tre månader efter aortakirurgin var smakförändringar och en stor trötthet som gjorde det omöjligt att vara uppe längre stunder. Detta skapade en oro över att klara det dagliga livet hemma eftersom närstående i många fall inte vare sig hade kraft eller förmåga att klara av hushållsgöromålen. Den oförutsedda och långa rehabiliteringsperioden tillsammans med svårigheterna att bearbeta sina upplevelser skapade starka känslor som var svåra att kontrollera, och inte sällan blev närstående måltavlor för denna frustration.

Delarbete III

Riskbenägenhet och preferens för behandling skilde sig signifikant inom befolkningsgruppen med den största skillnaden mellan den äldsta åldersgruppen (>80) och övriga åldersgrupper 50-59 (TTO $p=0,03$, SG $p=0,001$), 60-69 (TTO $p=0,01$, SG $p=0,001$), 70-79 (TTO $p=0,02$, SG ($p=0,002$)). Detta visar att

individerna i den äldsta gruppen inte är benägna att förkorta sitt liv eller ta en dödlig risk i lika hög grad som de yngre individerna. Resultatet visade även att de tre yngre grupperna var mer benägna att ta en risk med behandling än att förkorta sitt liv. Patientgruppen och den äldsta åldersgruppen skattade liknande resultat för TTO.

Delarbete IV

Patienter med svår IC var beredda att förkorta 3 år (median) av 10 möjliga år (TTO) och ta en dödlig risk (SG) på 13 % (median) för att få möjlighet att leva utan sina gångbesvär. Det fanns signifikanta samband mellan TTO och gångförmåga och smärta som visade att patienterna var beredda att förkorta fler år desto sämre gångförmåga och mer smärta. Patienternas kliniska parametrar och livskvalitet förbättrades signifikant av den kirurgiska behandlingen. Framst för smärta, rörlighet, dagliga aktiviteter och social funktion. Kostnadseffektivitetsanalysen baserad på värden på livskvalitet och överlevnad visade att kostnaden för behandling av svår IC ur ett sjukhusperspektiv kan anses vara kostnadseffektiv.

10.4 SLUTSATSER

Resultaten från studierna visar ett behov av en mer strukturerad uppföljning av informationen före operationen och en kontinuerlig dialog kring vård och behandling under hela vårdförloppet för att möta patientens vårdbehov, lindra symtom samt ge rimliga förväntningar på rehabiliteringsperioden. Informationen bör omfatta både den fysiska och emotionella påverkan som det kan innebära att genomgå aortakirurgi för att förbereda patienten på den stora omställningen. Det stora omvårdnadsbehov som ses efter aortakirurgi bör uppmärksammas av sjuksköterskorna för att förebygga symtom och underlätta tillfrisknande.

Riskbenägenhet och preferens för behandling av BAA bör beaktas utifrån den enskilda patientens situation och önskemål och speciellt bör äldre personers tveksamma inställning till en större operation som är förknippad med både risker och påverkan på dagligt liv uppmärksammas. Preferens för behandling bör även beaktas utifrån sjukdomens påverkan på livskvalitet, vilket kan innebära att patienten är beredd att ta en större risk med behandling än kärllkirurgen anser befogad. Om behandlingen även kan anses kostnadseffektiv bör denna möjlighet anses rimlig.

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12 REFERENCES

1. Spencer CA, Norman PE, Jamrozik K, Tuohy R, Lawrence-Brown M. Is screening for abdominal aortic aneurysm bad for your health and well-being? *ANZ J Surg.* 2004 Dec;74(12):1069-75.
2. Lindholt JS, Vammen S, Fasting H, Henneberg EW. Psychological consequences of screening for abdominal aortic aneurysm and conservative treatment of small abdominal aortic aneurysms. *Eur J Vasc Endovasc Surg.* 2000 Jul;20(1):79-83.
3. Wanhainen A, Rosen C, Rutegard J, Bergqvist D, Bjorck M. Low quality of life prior to screening for abdominal aortic aneurysm: a possible risk factor for negative mental effects. *Ann Vasc Surg.* 2004 May;18(3):287-93.
4. Rutherford RB. Management of abdominal aortic aneurysms: which risk factors play a role in decision-making? *Semin Vasc Surg.* 2008 Sep;21(3):124-31.
5. Ouriel K. The PIVOTAL study: a randomized comparison of endovascular repair versus surveillance in patients with smaller abdominal aortic aneurysms. *J Vasc Surg.* 2009 Jan;49(1):266-9.
6. Patterson BO, Holt PJ, Hinchliffe R, Loftus IM, Thompson MM. Predicting risk in elective abdominal aortic aneurysm repair: a systematic review of current evidence. *Eur J Vasc Endovasc Surg.* 2008 Dec;36(6):637-45.
7. Upchurch GR, Jr., Eliason JL, Rectenwald JE, Escobar G, Kabbani L, Criado E. Endovascular abdominal aortic aneurysm repair versus open repair: why and why not? *Perspect Vasc Surg Endovasc Ther.* 2009 Mar;21(1):48-53.
8. Aljabri B, Al Wahaibi K, Abner D, et al. Patient-reported quality of life after abdominal aortic aneurysm surgery: a prospective comparison of endovascular and open repair. *J Vasc Surg.* 2006 Dec;44(6):1182-7.
9. Williamson WK, Nicoloff AD, Taylor LM, Jr., Moneta GL, Landry GJ, Porter JM. Functional outcome after open repair of abdominal aortic aneurysm. *J Vasc Surg.* 2001 May;33(5):913-20.
10. Myers SA, Johanning JM, Stergiou N, Lynch TG, Longo GM, Pipinos II. Claudication distances and the Walking Impairment Questionnaire best describe the ambulatory limitations in patients with symptomatic peripheral arterial disease. *J Vasc Surg.* 2008 Mar;47(3):550-5.
11. Nehler MR, McDermott MM, Treat-Jacobson D, Chetter I, Regensteiner JG. Functional outcomes and quality of life in peripheral arterial disease: current status. *Vasc Med.* 2003 May;8(2):115-26.
12. Klevsgard R, Hallberg IR, Risberg B, Thomsen MB. Quality of life associated with varying degrees of chronic lower limb ischaemia: comparison with a healthy sample. *Eur J Vasc Endovasc Surg.* 1999 Apr;17(4):319-25.
13. Wann-Hansson C, Hallberg IR, Risberg B, Klevsgard R. A comparison of the Nottingham Health Profile and Short Form 36 Health Survey in patients with chronic lower limb ischaemia in a longitudinal perspective. *Health Qual Life Outcomes.* 2004 Feb 17;2:9.

14. Muir RL. Peripheral arterial disease: Pathophysiology, risk factors, diagnosis, treatment, and prevention. *J Vasc Nurs.* 2009 Jun;27(2):26-30.
15. Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg.* 2007 Jan;45 Suppl S:S5-67.
16. Meru AV, Mittra S, Thyagarajan B, Chugh A. Intermittent claudication: an overview. *Atherosclerosis.* 2006 Aug;187(2):221-37.
17. Hälso- och sjukvårdslagen. (SFS 1982:763) och Propositionen 1998/99:4 Stärkt patientinflytande (beslutad av regeringen i juni 1998).
18. Beauchamp T, Childress J. Principles of biomedical ethics. 5th ed. New York: NY: Oxford University Press; 2001.
19. Berman L, Dardik A, Bradley EH, Gusberg RJ, Fraenkel L. Informed consent for abdominal aortic aneurysm repair: assessing variations in surgeon opinion through a national survey. *J Vasc Surg.* 2008 Feb;47(2):287-95.
20. Berman L, Curry L, Gusberg R, Dardik A, Fraenkel L. Informed consent for abdominal aortic aneurysm repair: The patient's perspective. *J Vasc Surg.* 2008 Aug;48(2):296-302.
21. Keeney R, Raiffa H. Decisions with multiple objectives: preference and value tradeoffs. New York: Wiley; 1976.
22. Bosch JL, Hunink MG. The relationship between descriptive and valuational quality-of-life measures in patients with intermittent claudication. *Med Decis Making.* 1996 Jul-Sep;16(3):217-25.
23. de Vries SO, Kuipers WD, Hunink MG. Intermittent claudication: symptom severity versus health values. *J Vasc Surg.* 1998 Mar;27(3):422-30.
24. Muszbek N, Thompson MM, Soong CV, Hutton J, Brasseur P, van Sambeek MR. Systematic review of utilities in abdominal aortic aneurysm. *Eur J Vasc Endovasc Surg.* 2008 Sep;36(3):283-9.
25. van Roosmalen MS, Stalmeier PF, Verhoef LC, et al. Randomized trial of a shared decision-making intervention consisting of trade-offs and individualized treatment information for BRCA1/2 mutation carriers. *J Clin Oncol.* 2004 Aug 15;22(16):3293-301.
26. Gibson JM, Kenrick M. Pain and powerlessness: the experience of living with peripheral vascular disease. *J Adv Nurs.* 1998 Apr;27(4):737-45.
27. Wann-Hansson C, Hallberg IR, Klevsgard R, Andersson E. Patients' experiences of living with peripheral arterial disease awaiting intervention: a qualitative study. *Int J Nurs Stud.* 2005 Nov;42(8):851-62.
28. Wann-Hansson C, Rahm Hallberg I, Klevsgard R, Andersson E. The long-term experience of living with peripheral arterial disease and the recovery following revascularisation: a qualitative study. *Int J Nurs Stud.* 2008 Apr;45(4):552-61.
29. Johnstone CC. Living with peripheral vascular disease: patients and their carers. *Nurs Times.* 2004 Sep 28-Oct 4;100(39):36-9.
30. Brannstrom M, Bjorck M, Strandberg G, Wanhainen A. Patients' experiences of being informed about having an abdominal aortic aneurysm - a follow-up case study five years after screening. *J Vasc Nurs.* 2009 Sep;27(3):70-4.

31. Deeny P, Kirk-Smith M. Colloquial descriptions of body image in older surgical patients. *Intensive Crit Care Nurs.* 2000 Oct;16(5):304-9.
32. Meleis AI, Sawyer LM, Im EO, Hilfinger Messias DK, Schumacher K. Experiencing transitions: an emerging middle-range theory. *ANS Adv Nurs Sci.* 2000 Sep;23(1):12-28.
33. Chick N, Meleis A. Transitions: a nursing concern. In: Chinn P (ed). *Nursing research methodology: issues and implementation.* Rockville, Md: Aspen Publishers, 1986:237-57.
34. Schumacher K, Jones P, Meleis A. Life transition in older adults. Chapert 1 *Helping elderly in transition: A framework for research and practice.* Advances in Gerontological Nursing. New York: Springer publishing company; 1999.
35. Johnston KW, Rutherford RB, Tilson MD, Shah DM, Hollier L, Stanley JC. Suggested standards for reporting on arterial aneurysms. Subcommittee on Reporting Standards for Arterial Aneurysms, Ad Hoc Committee on Reporting Standards, Society for Vascular Surgery and North American Chapter, International Society for Cardiovascular Surgery. *J Vasc Surg.* 1991 Mar;13(3):452-8.
36. Brunkwall J, Hauksson H, Bengtsson H, Bergqvist D, Takolander R, Bergentz SE. Solitary aneurysms of the iliac arterial system: an estimate of their frequency of occurrence. *J Vasc Surg.* 1989 Oct;10(4):381-4.
37. Wassef M, Upchurch GR, Jr., Kuivaniemi H, Thompson RW, Tilson MD, 3rd. Challenges and opportunities in abdominal aortic aneurysm research. *J Vasc Surg.* 2007 Jan;45(1):192-8.
38. Lederle FA. In the clinic. Abdominal aortic aneurysm. *Ann Intern Med.* 2009 May 5;150(9):ITC5-1-15; quiz ITC5-6.
39. Boll AP, Verbeek AL, van de Lisdonk EH, van der Vliet JA. High prevalence of abdominal aortic aneurysm in a primary care screening programme. *Br J Surg.* 1998 Aug;85(8):1090-4.
40. Jamrozik K, Norman PE, Spencer CA, et al. Screening for abdominal aortic aneurysm: lessons from a population-based study. *Med J Aust.* 2000 Oct 2;173(7):345-50.
41. Pleumeekers HJ, Hoes AW, van der Does E, et al. Aneurysms of the abdominal aorta in older adults. The Rotterdam Study. *Am J Epidemiol.* 1995 Dec 15;142(12):1291-9.
42. Singh K, Bonna KH, Jacobsen BK, Bjork L, Solberg S. Prevalence of and risk factors for abdominal aortic aneurysms in a population-based study : The Tromso Study. *Am J Epidemiol.* 2001 Aug 1;154(3):236-44.
43. Lederle FA, Johnson GR, Wilson SE, et al. The aneurysm detection and management study screening program: validation cohort and final results. Aneurysm Detection and Management Veterans Affairs Cooperative Study Investigators. *Arch Intern Med.* 2000 May 22;160(10):1425-30.
44. Wanhainen A. How to define an abdominal aortic aneurysm--influence on epidemiology and clinical practice. *Scand J Surg.* 2008;97(2):105-9; discussion 9.

45. The UK Small Aneurysm Trial Participants. Mortality results for randomised controlled trial of early elective surgery or ultrasonographic surveillance for small abdominal aortic aneurysms. *Lancet*. 1998 Nov 21;352(9141):1649-55.
46. Grootenboer N, Bosch JL, Hendriks JM, van Sambeek MR. Epidemiology, aetiology, risk of rupture and treatment of abdominal aortic aneurysms: does sex matter? *Eur J Vasc Endovasc Surg*. 2009 Sep;38(3):278-84.
47. Johansen K, Kohler TR, Nicholls SC, Zierler RE, Clowes AW, Kazmers A. Ruptured abdominal aortic aneurysm: the Harborview experience. *J Vasc Surg*. 1991 Feb;13(2):240-5; discussion 5-7.
48. Fleming C, Whitlock EP, Beil TL, Lederle FA. Screening for abdominal aortic aneurysm: a best-evidence systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2005 Feb 1;142(3):203-11.
49. Powell JT, Brown LC, Forbes JF, et al. Final 12-year follow-up of surgery versus surveillance in the UK Small Aneurysm Trial. *Br J Surg*. 2007 Jun;94(6):702-8.
50. Hirsch AT, Haskal ZJ, Hertzner NR, et al. ACC/AHA 2005 guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): executive summary a collaborative report from the American Association for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Peripheral Arterial Disease) endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation; National Heart, Lung, and Blood Institute; Society for Vascular Nursing; TransAtlantic Inter-Society Consensus; and Vascular Disease Foundation. *J Am Coll Cardiol*. 2006 Mar 21;47(6):1239-312.
51. McPhee JT, Hill JS, Eslami MH. The impact of gender on presentation, therapy, and mortality of abdominal aortic aneurysm in the United States, 2001-2004. *J Vasc Surg*. 2007 May;45(5):891-9.
52. Blankensteijn JD, de Jong SE, Prinssen M, et al. Two-year outcomes after conventional or endovascular repair of abdominal aortic aneurysms. *N Engl J Med*. 2005 Jun 9;352(23):2398-405.
53. Wanhainen A, Bylund N, Bjorck M. Outcome after abdominal aortic aneurysm repair in Sweden 1994-2005. *Br J Surg*. 2008 May;95(5):564-70.
54. Geraghty PJ, Sicard GA. Abdominal aortic aneurysm repair in high-risk and elderly patients. *J Cardiovasc Surg (Torino)*. 2003 Aug;44(4):543-7.
55. EVAR trial participants. Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial. *Lancet*. 2005 Jun 25-Jul 1;365(9478):2179-86.
56. Prinssen M, Verhoeven EL, Buth J, et al. A randomized trial comparing conventional and endovascular repair of abdominal aortic aneurysms. *N Engl J Med*. 2004 Oct 14;351(16):1607-18.
57. Mani K, Bjorck M, Lundkvist J, Wanhainen A. Improved long-term survival after abdominal aortic aneurysm repair. *Circulation*. 2009 Jul 21;120(3):201-11.
58. Anderson LA. Abdominal aortic aneurysm. *J Cardiovasc Nurs*. 2001 Jul;15(4):1-14.

59. Papia G, Klein D, Lindsay TF. Intensive care of the patient following open abdominal aortic surgery. *Curr Opin Crit Care*. 2006 Aug;12(4):340-5.
60. Dillavou ED, Muluk SC, Makaroun MS. Improving aneurysm-related outcomes: nationwide benefits of endovascular repair. *J Vasc Surg*. 2006 Mar;43(3):446-51; discussion 51-2.
61. Lee WA, Carter JW, Upchurch G, Seeger JM, Huber TS. Perioperative outcomes after open and endovascular repair of intact abdominal aortic aneurysms in the United States during 2001. *J Vasc Surg*. 2004 Mar;39(3):491-6.
62. Bick C. Abdominal aortic aneurysm repair. *Nurs Stand*. 2000 Oct 4;15(3):47-52; quiz 4-5.
63. Wilt TJ, Lederle FA, Macdonald R, Jonk YC, Rector TS, Kane RL. Comparison of endovascular and open surgical repairs for abdominal aortic aneurysm. *Evid Rep Technol Assess (Full Rep)*. 2006 Aug(144):1-113.
64. Arko FR, Hill BB, Reeves TR, et al. Early and late functional outcome assessments following endovascular and open aneurysm repair. *J Endovasc Ther*. 2003 Feb;10(1):2-9.
65. Vogel TR, Nackman GB, Crowley JG, et al. Factors impacting functional health and resource utilization following abdominal aortic aneurysm repair by open and endovascular techniques. *Ann Vasc Surg*. 2005 Sep;19(5):641-7.
66. Dick F, Grobety V, Immer FF, et al. Outcome and quality of life in patients treated for abdominal aortic aneurysms: a single center experience. *World J Surg*. 2008 Jun;32(6):987-94.
67. Lee ES, Kor DJ, Kuskowski MA, Santilli SM. Incidence of erectile dysfunction after open abdominal aortic aneurysm repair. *Ann Vasc Surg*. 2000 Jan;14(1):13-9.
68. Pettersson M, Mattsson E, Bergbom I. Prospective follow-up of sexual function after elective repair of abdominal aortic aneurysms using open and endovascular techniques. *J Vasc Surg*. 2009 Sep;50(3):492-9.
69. Galloway S, Rebeyka D, Saxe-Braithwaite M, Bubela N, McKibbin A. Discharge information needs and symptom distress after abdominal aortic surgery. *Can J Cardiovasc Nurs*. 1997;8(3):9-15.
70. Cimminiello C. PAD. Epidemiology and pathophysiology. *Thromb Res*. 2002 Jun 1;106(6):V295-301.
71. Bhatt DL, Steg PG, Ohman EM, et al. International prevalence, recognition, and treatment of cardiovascular risk factors in outpatients with atherothrombosis. *JAMA*. 2006 Jan 11;295(2):180-9.
72. Tran H, Anand SS. Oral antiplatelet therapy in cerebrovascular disease, coronary artery disease, and peripheral arterial disease. *JAMA*. 2004 Oct 20;292(15):1867-74.
73. Aronow H, Hiatt WR. The burden of peripheral artery disease and the role of antiplatelet therapy. *Postgrad Med*. 2009 Jul;121(4):123-35.
74. Rose GA. Diagnosis of Ischaemic Heart Pain and Intermittent Claudication in Field Surveys. *Bulletin of the World Health Organization*. 1962;27(6):645-&.

75. Rutherford RB, Baker JD, Ernst C, et al. Recommended standards for reports dealing with lower extremity ischemia: revised version. *J Vasc Surg.* 1997 Sep;26(3):517-38.
76. Lewis CD. Peripheral arterial disease of the lower extremity. *J Cardiovasc Nurs.* 2001 Jul;15(4):45-63; quiz 96-7.
77. Criqui MH, Fronek A, Barrett-Connor E, Klauber MR, Gabriel S, Goodman D. The prevalence of peripheral arterial disease in a defined population. *Circulation.* 1985 Mar;71(3):510-5.
78. Sigvant B, Wiberg-Hedman K, Bergqvist D, et al. A population-based study of peripheral arterial disease prevalence with special focus on critical limb ischemia and sex differences. *J Vasc Surg.* 2007 Jun;45(6):1185-91.
79. Meijer WT, Hoes AW, Rutgers D, Bots ML, Hofman A, Grobbee DE. Peripheral arterial disease in the elderly: The Rotterdam Study. *Arterioscler Thromb Vasc Biol.* 1998 Feb;18(2):185-92.
80. Ostchega Y, Paulose-Ram R, Dillon CF, Gu Q, Hughes JP. Prevalence of peripheral arterial disease and risk factors in persons aged 60 and older: data from the National Health and Nutrition Examination Survey 1999-2004. *J Am Geriatr Soc.* 2007 Apr;55(4):583-9.
81. Hirsch AT, Criqui MH, Treat-Jacobson D, et al. Peripheral arterial disease detection, awareness, and treatment in primary care. *JAMA.* 2001 Sep 19;286(11):1317-24.
82. Selvin E, Erlinger TP. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999-2000. *Circulation.* 2004 Aug 10;110(6):738-43.
83. Aronow WS, Ahn C, Gutstein H. Prevalence and incidence of cardiovascular disease in 1160 older men and 2464 older women in a long-term health care facility. *J Gerontol A Biol Sci Med Sci.* 2002 Jan;57(1):M45-6.
84. Ness J, Aronow WS, Ahn C. Risk factors for symptomatic peripheral arterial disease in older persons in an academic hospital-based geriatrics practice. *J Am Geriatr Soc.* 2000 Mar;48(3):312-4.
85. Bartholomew JR, Olin JW. Pathophysiology of peripheral arterial disease and risk factors for its development. *Cleve Clin J Med.* 2006 Oct;73 Suppl 4:S8-14.
86. Leng GC, Lee AJ, Fowkes FG, et al. Incidence, natural history and cardiovascular events in symptomatic and asymptomatic peripheral arterial disease in the general population. *Int J Epidemiol.* 1996 Dec;25(6):1172-81.
87. Dormandy J, Heck L, Vig S. The natural history of claudication: risk to life and limb. *Semin Vasc Surg.* 1999 Jun;12(2):123-37.
88. Ness J, Aronow WS. Prevalence of coexistence of coronary artery disease, ischemic stroke, and peripheral arterial disease in older persons, mean age 80 years, in an academic hospital-based geriatrics practice. *J Am Geriatr Soc.* 1999 Oct;47(10):1255-6.
89. Fowkes FG, Low LP, Tuta S, Kozak J. Ankle-brachial index and extent of atherothrombosis in 8891 patients with or at risk of vascular disease: results of the international AGATHA study. *Eur Heart J.* 2006 Aug;27(15):1861-7.

90. Steg PG, Bhatt DL, Wilson PW, et al. One-year cardiovascular event rates in outpatients with atherothrombosis. *JAMA*. 2007 Mar 21;297(11):1197-206.
91. Arain FA, Cooper LT, Jr. Peripheral arterial disease: diagnosis and management. *Mayo Clin Proc*. 2008 Aug;83(8):944-49; quiz 9-50.
92. Leng GC, Fowler B, Ernst E. Exercise for intermittent claudication. *Cochrane Database Syst Rev*. 2000(2):CD000990.
93. Ouriel K. Peripheral arterial disease. *Lancet*. 2001 Oct 13;358(9289):1257-64.
94. Schmieder FA, Comerota AJ. Intermittent claudication: magnitude of the problem, patient evaluation, and therapeutic strategies. *Am J Cardiol*. 2001 Jun 28;87(12A):3D-13D.
95. Network SIG. Diagnosis and management of peripheral arterial disease: a national clinical guideline. Edinburgh, Scotland: SIGN; 2006.
96. Bosch JL, Hunink MG. Meta-analysis of the results of percutaneous transluminal angioplasty and stent placement for aortoiliac occlusive disease. *Radiology*. 1997 Jul;204(1):87-96.
97. Twine CP, Coulston J, Shandall A, McLain AD. Angioplasty versus stenting for superficial femoral artery lesions. *Cochrane Database Syst Rev*. 2009(2):CD006767.
98. Kudo T, Chandra FA, Kwun WH, Haas BT, Ahn SS. Changing pattern of surgical revascularization for critical limb ischemia over 12 years: endovascular vs. open bypass surgery. *J Vasc Surg*. 2006 Aug;44(2):304-13.
99. Kudo T, Chandra FA, Ahn SS. The effectiveness of percutaneous transluminal angioplasty for the treatment of critical limb ischemia: a 10-year experience. *J Vasc Surg*. 2005 Mar;41(3):423-35; discussion 35.
100. Varty K, Bolia A, Naylor AR, Bell PR, London NJ. Infrapopliteal percutaneous transluminal angioplasty: a safe and successful procedure. *Eur J Vasc Endovasc Surg*. 1995 Apr;9(3):341-5.
101. London NJ, Srinivasan R, Naylor AR, et al. Subintimal angioplasty of femoropopliteal artery occlusions: the long-term results. *Eur J Vasc Surg*. 1994 Mar;8(2):148-55.
102. Axisa B, Fishwick G, Bolia A, et al. Complications following peripheral angioplasty. *Ann R Coll Surg Engl*. 2002 Jan;84(1):39-42.
103. Cassar CA, Dow MP, Pursley JR, Smith GW. Effect of the preovulatory LH surge on bovine follicular progesterone receptor mRNA expression. *Domest Anim Endocrinol*. 2002 May;22(3):179-87.
104. Spronk S, Bosch JL, Veen HF, den Hoed PT, Hunink MG. Intermittent claudication: functional capacity and quality of life after exercise training or percutaneous transluminal angioplasty--systematic review. *Radiology*. 2005 Jun;235(3):833-42.
105. Kleivsgard R, Hallberg IR, Risberg B, Thomsen MB. The effects of successful intervention on quality of life in patients with varying degrees of lower-limb ischaemia. *Eur J Vasc Endovasc Surg*. 2000 Mar;19(3):238-45.

106. Feinglass J, Morasch M, McCarthy WJ. Measures of success and health-related quality of life in lower-extremity vascular surgery. *Annu Rev Med.* 2000;51:101-13.
107. Landry GJ. Functional outcome of critical limb ischemia. *J Vasc Surg.* 2007 Jun;45 Suppl A:A141-8.
108. McDowell I. *Measuring Health - A Guide to Rating Scales and Questionnaires.* 3rd ed. New York: Oxford University Press; 2006.
109. WHO. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 states (Official Records of the WHO, no. 2, p. 100) and entered into force on 7 April 1948, 1946.
110. Bowling A. *Measuring health - A review of quality of life measurement scales.* 3 ed. Berkshire: Open University Press; 2005.
111. Cella DF, Tulsky DS. Measuring quality of life today: methodological aspects. *Oncology (Williston Park).* 1990 May;4(5):29-38; discussion 69.
112. Plummer M, Molzahn AE. Quality of life in contemporary nursing theory: a concept analysis. *Nurs Sci Q.* 2009 Apr;22(2):134-40.
113. WHOQOL GROUP. The World Health Organization Quality of Life assessment (WHOQOL): position paper from the World Health Organization. *Soc Sci Med.* 1995 Nov;41(10):1403-9.
114. Low G, Molzahn AE. Predictors of quality of life in old age: a cross-validation study. *Res Nurs Health.* 2007 Apr;30(2):141-50.
115. Shumaker S, Naughton M. The international assessment of health-related quality of life: a theoretical perspective. In Shumaker S, Berzon R, eds. *The International Assessment of Health - Related Quality of Life: Theory, Translation, Measurement & Analysis.* New York: Rapid Communications of Oxford Ltd; 1995.
116. Berzon R, Hays RD, Shumaker SA. International use, application and performance of health-related quality of life instruments. *Qual Life Res.* 1993 Dec;2(6):367-8.
117. Fayers P, Machin D. *Quality of Life: Assessment, Analysis and Interpretation.* Chichester: Wiley & Sons Ltd; 2000.
118. Dolan P. The measurement of health - related quality of life. In *Handbook of Health Economics, Culyer AJ.* In: JP N (ed). Amsterdam, 2000:1723-55.
119. Drummond M, Sculpher M, Torrance G, O'Brien B, Stoddart G. *Methods for the Economic Evaluation of Health Care Programmes.* 3 ed. New York: Oxford University Press; 2005.
120. Bowling A, Ebrahim S. Measuring patients' preferences for treatment and perceptions of risk. *Qual Health Care.* 2001 Sep;10 Suppl 1:i2-8.
121. von Neumann J, Morgenstern o. *Theory of games and economic behaviour.* Princeton, New Jersey: Princeton University Press; 1944.
122. Holloway C. *Decision making under uncertainty: models and choices.* Englewood Cliffs, New Jersey: Prentice-Hall; 1979.

123. Gafni A, Torrance G. Risk attitude and time preference in health Management Science. 1984;30:440-51.
124. Fitzpatrick R, Davey C, Buxton M, Jones D. Criteria for assessing patient based outcome measures for use in clinical trials. In:Stevens A, Abrams K, Brazier J, Fitzpatrick R, Lilford R, eds The advanced handbook of methods in evidence based healthcare. London: Sage; 2001.
125. Asadi-Lari M, Tamburini M, Gray D. Patients' needs, satisfaction, and health related quality of life: towards a comprehensive model. Health Qual Life Outcomes. 2004 Jun 29;2:32.
126. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: bibliographic study of patient assessed health outcome measures. BMJ. 2002 Jun 15;324(7351):1417.
127. Engstrom CP, Persson LO, Larsson S, Sullivan M. Health-related quality of life in COPD: why both disease-specific and generic measures should be used. Eur Respir J. 2001 Jul;18(1):69-76.
128. Ware JE. Measuring patients' views: the optimum outcome measure. BMJ. 1993 May 29;306(6890):1429-30.
129. Briggs A, Claxton K, Sculpher M. Decision Modelling for Health Economic Evaluation. New York: Oxford University Press; 2006.
130. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992 Jun;30(6):473-83.
131. Hunt SM, McEwen J, McKenna SP. Measuring health status: a new tool for clinicians and epidemiologists. J R Coll Gen Pract. 1985 Apr;35(273):185-8.
132. Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: development and final revision of a health status measure. Med Care. 1981 Aug;19(8):787-805.
133. Chetter IC, Dolan P, Spark JJ, Scott DJ, Kester RC. Correlating clinical indicators of lower-limb ischaemia with quality of life. Cardiovasc Surg. 1997 Aug;5(4):361-6.
134. Klevsgard R, Froberg BL, Risberg B, Hallberg IR. Nottingham Health Profile and Short-Form 36 Health Survey questionnaires in patients with chronic lower limb ischemia: before and after revascularization. J Vasc Surg. 2002 Aug;36(2):310-7.
135. Mangione CM, Goldman L, Orav EJ, et al. Health-related quality of life after elective surgery: measurement of longitudinal changes. J Gen Intern Med. 1997 Nov;12(11):686-97.
136. Prinssen M, Buskens E, Blankensteijn JD. Quality of life endovascular and open AAA repair. Results of a randomised trial. Eur J Vasc Endovasc Surg. 2004 Feb;27(2):121-7.
137. EVAR trial participants. Endovascular aneurysm repair and outcome in patients unfit for open repair of abdominal aortic aneurysm (EVAR trial 2): randomised controlled trial. Lancet. 2005 Jun 25-Jul 1;365(9478):2187-92.

138. Lottman PE, Laheij RJ, Cuypers PW, Bender M, Buth J. Health-related quality of life outcomes following elective open or endovascular AAA repair: a randomized controlled trial. *J Endovasc Ther.* 2004 Jun;11(3):323-9.
139. EuroQoL Group. EuroQoL- a new facility for the measurement of health-related quality of life. *Health Policy.* 1990;16:199-208.
140. Essink-Bot ML, Stouthard ME, Bonsel GJ. Generalizability of valuations on health states collected with the EuroQolc-questionnaire. *Health Econ.* 1993 Oct;2(3):237-46.
141. Brooks R. EuroQol: the current state of play. *Health Policy.* 1996 Jul;37(1):53-72.
142. Kind P. The EuroQol instrument: an index of health-related quality of life. In *Quality of life and pharmacoeconomics in clinical trials*. 2nd ed. Philadelphia: Lippincott-Raven; 1996.
143. Rose GA. The diagnosis of ischaemic heart pain and intermittent claudication in field surveys. *Bull World Health Organ.* 1962;27:645-58.
144. Regensteiner J, Steiner J, Panzer R, Hiatt WR. Evaluation of walking impairment questionnaire in patients with peripheral arterial disease. *J Vasc Med Biol.* 1990;2:142-54.
145. Spengel F, Brown T, Dietze S, Kirchberger I, Comte S. The Claudication Scale (CLAU-S). A new disease-specific quality of life instrument in intermittent claudication. *Disease Management and Health Outcomes.* 1997;2, suppl 1:65-70.
146. Chong PF, Garratt AM, Golledge J, Greenhalgh RM, Davies AH. The intermittent claudication questionnaire: a patient-assessed condition-specific health outcome measure. *J Vasc Surg.* 2002 Oct;36(4):764-71; discussion 863-4.
147. Morgan MB, Crayford T, Murrin B, Fraser SC. Developing the Vascular Quality of Life Questionnaire: a new disease-specific quality of life measure for use in lower limb ischemia. *J Vasc Surg.* 2001 Apr;33(4):679-87.
148. Spertus J, Jones P, Poler S, Rocha-Singh K. The peripheral artery questionnaire: a new disease-specific health status measure for patients with peripheral arterial disease. *Am Heart J.* 2004 Feb;147(2):301-8.
149. Mehta T, Venkata Subramaniam A, Chetter I, McCollum P. Disease-specific quality of life assessment in intermittent claudication: review. *Eur J Vasc Endovasc Surg.* 2003 Mar;25(3):202-8.
150. de Vries M, Ouwendijk R, Kessels AG, et al. Comparison of generic and disease-specific questionnaires for the assessment of quality of life in patients with peripheral arterial disease. *J Vasc Surg.* 2005 Feb;41(2):261-8.
151. Torrance GW, Thomas WH, Sackett DL. A utility maximization model for evaluation of health care programs. *Health Serv Res.* 1972 Summer;7(2):118-33.
152. Torrance GW, Boyle MH, Horwood SP. Application of multi-attribute utility theory to measure social preferences for health states. *Oper Res.* 1982 Nov-Dec;30(6):1043-69.

153. Torrance GW. Measurement of health state utilities for economic appraisal. *J Health Econ.* 1986 Mar;5(1):1-30.
154. Torrance GW. Utility approach to measuring health-related quality of life. *J Chronic Dis.* 1987;40(6):593-603.
155. Furlong W, Feeney D, Torrance G, Barr R, Horsman J. Guide to design and development of health-state utility instrumentation. Hamilton, Ontario: McMaster University, Center for Health Economics and Policy Analysis, 1990.
156. Kaplan RM, Anderson JP. A general health policy model: update and applications. *Health Serv Res.* 1988 Jun;23(2):203-35.
157. Kaplan RM, Anderson JP. The general health policy model: an intergrated approach. In *Quality of life and pharmacoeconomics in clinical trials*. 2nd ed. Philadelphia: Lippincott-Raven; 1996.
158. Furlong WJ, Feeny DH, Torrance GW, Barr RD. The Health Utilities Index (HUI) system for assessing health-related quality of life in clinical studies. *Ann Med.* 2001 Jul;33(5):375-84.
159. Horsman J, Furlong W, Feeny D, Torrance G. The Health Utilities Index (HUI): concepts, measurement properties and applications. *Health Qual Life Outcomes.* 2003;1:54.
160. Dolan P, Gudex C. Time preference, duration and health state valuations. *Health Econ.* 1995 Jul-Aug;4(4):289-99.
161. Dolan P, Gudex C, Kind P, Williams A. The time trade-off method: results from a general population study. *Health Econ.* 1996 Mar-Apr;5(2):141-54.
162. Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ.* 2002 Mar;21(2):271-92.
163. Patton M. *Qualitative Research and Evaluation Methods*. 3rd ed. London: SAGE Publication; 2002.
164. Nordstrom G, Nyman CR, Theorell T. Psychosocial adjustment and general state of health in patients with ileal conduit urinary diversion. *Scand J Urol Nephrol.* 1992;26(2):139-47.
165. Switzer G, Wisniewski S, Belle S, Dew M, Schultz R. Selecting, developing, and evaluating research instruments. *Soc Psychiatry Psychiatr Epidemiol.* 1999;34:399-409.
166. Spector P. *Summated Raring Scale Construction: An Introduction* Beverly Hills and London: Sage Publications, Inc; 1992.
167. American Educational Research Association, American Psychological Association, National Council on Measurement in Education. *Standards for Educational and Psychological Testing*. Whashington DC: American Educational Research Association; 1999.
168. Stewart AL, Ware JE. *Measuring functioning and well-being: the Medical Outcomes Study approach*. Durham, NC: Duke University Press; 1992.
169. Langius A, Bjorvell H, Lind MG. Oral- and pharyngeal-cancer patients' perceived symptoms and health. *Cancer Nurs.* 1993 Jun;16(3):214-21.

170. Forsberg C, Bjorvell H. Swedish population norms for the GHRI, HI and STAI-state. *Qual Life Res.* 1993 Oct;2(5):349-56.
171. Forsberg C. The sense of well-being in a group of patients with gastro-intestinal cancer. Aspects of health-related quality of life and coping. Doctoral (PhD) Dissertation Stockholm, Sweden: Karolinska Institutet, 1996.
172. Stewart AL, Hays RD, Ware JE, Jr. The MOS short-form general health survey. Reliability and validity in a patient population. *Med Care.* 1988 Jul;26(7):724-35.
173. Ware JE, Kosinski M. The SF-36 Health Survey (Version 2.0) Technical Note. Boston, MA: Health Assessment Lab, September 20, 1996 (Updates september 27, 1997).
174. Ware JE, Kosinski M, Keller S. SF-36 Physical and Mental Health Summary Scales: A User's Manual. Boston, MA: The health Institute. 1994.
175. Ware JE, Snow K, Kosinski M, et al. SF-36 Health Survey Manual and Interpretation Guide. Boston, MA: New England Medical Center, The Health Institute. 1993.
176. Sullivan M, Karlsson J, Ware JE, Jr. The Swedish SF-36 Health Survey--I. Evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. *Soc Sci Med.* 1995 Nov;41(10):1349-58.
177. Tsai C, Bayliss M, Ware JE. Health Survey Annotated Bibliography: (1988-1996). 2nd ed. Boston: MA:Health Assessment Lab, New England Medical Center; 1997.
178. McHorney CA, Ware JE, Jr., Lu JF, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care.* 1994 Jan;32(1):40-66.
179. Ware JE, Jr. SF-36 health survey update. *Spine (Phila Pa 1976).* 2000 Dec 15;25(24):3130-9.
180. McHorney CA, Ware JE, Jr., Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Med Care.* 1993 Mar;31(3):247-63.
181. Nerenz DR, Repasky DP, Whitehouse FW, Kahkonen DM. Ongoing assessment of health status in patients with diabetes mellitus. *Med Care.* 1992 May;30(5 Suppl):MS112-24.
182. Kosinski M, Kujawski SC, Martin R, et al. Health-related quality of life in early rheumatoid arthritis: impact of disease and treatment response. *Am J Manag Care.* 2002 Mar;8(3):231-40.
183. Essink-Bot ML, Krabbe PF, Bonsel GJ, Aaronson NK. An empirical comparison of four generic health status measures. The Nottingham Health Profile, the Medical Outcomes Study 36-item Short-Form Health Survey, the COOP/WONCA charts, and the EuroQol instrument. *Med Care.* 1997 May;35(5):522-37.
184. Hicken GJ, Lossing AG, Ameli M. Assessment of generic health-related quality of life in patients with intermittent claudication. *Eur J Vasc Endovasc Surg.* 2000 Oct;20(4):336-41.

185. Keeling AN, Naughton PA, O'Connell A, Lee MJ. Does percutaneous transluminal angioplasty improve quality of life? *J Vasc Interv Radiol.* 2008 Feb;19(2 Pt 1):169-76.
186. Mazari FA, Gulati S, Rahman MN, et al. Early Outcomes From a Randomized, Controlled Trial of Supervised Exercise, Angioplasty, and Combined Therapy in Intermittent Claudication. *Ann Vasc Surg.* 2009 Sep 15.
187. Dolan MJ, Clerici M, Blatt SP, et al. In vitro T cell function, delayed-type hypersensitivity skin testing, and CD4+ T cell subset phenotyping independently predict survival time in patients infected with human immunodeficiency virus. *J Infect Dis.* 1995 Jul;172(1):79-87.
188. Dolan P. Modeling valuations for EuroQol health states. *Med Care.* 1997 Nov;35(11):1095-108.
189. Uyl-de Groot CA, Rutten FF, Bonsel GJ. Measurement and valuation of quality of life in economic appraisal of cancer treatment. *Eur J Cancer.* 1994;30A(1):111-7.
190. Van Agt H, Essinck-Bot M, Krabbe P, al. e. Test-retest reliability of health state evaluations collected with the EuroQol questionnaire. *Social Science and Medecine.* 1994;39:1537-44.
191. Brazier J, Jones N, Kind P. Testing the validity of the Euroqol and comparing it with the SF-36 health survey questionnaire. *Qual Life Res.* 1993 Jun;2(3):169-80.
192. Burstrom K, Johannesson M, Diderichsen F. Swedish population health-related quality of life results using the EQ-5D. *Qual Life Res.* 2001;10(7):621-35.
193. Bosch JL, van der Graaf Y, Hunink MG. Health-related quality of life after angioplasty and stent placement in patients with iliac artery occlusive disease: results of a randomized controlled clinical trial. The Dutch Iliac Stent Trial Study Group. *Circulation.* 1999 Jun 22;99(24):3155-60.
194. Cook TA, O'Regan M, Galland RB. Quality of life following percutaneous transluminal angioplasty for claudication. *Eur J Vasc Endovasc Surg.* 1996 Feb;11(2):191-4.
195. Chetter IC, Spark JI, Scott DJ, Kester RC. Does angioplasty improve the quality of life for claudicants?: A prospective study. *Ann Vasc Surg.* 1999 Jan;13(1):93-103.
196. Regensteiner JG, Steiner JF, Panzer R, Hiatt WR. Evaluation of walking impairment by questionnaire in patients with peripheral arterial disease. *J Vasc Med Biol.* 1990;2:142-52.
197. McDermott MM, Liu K, Guralnik JM, Martin GJ, Criqui MH, Greenland P. Measurement of walking endurance and walking velocity with questionnaire: validation of the walking impairment questionnaire in men and women with peripheral arterial disease. *J Vasc Surg.* 1998 Dec;28(6):1072-81.
198. Feinglass J, McCarthy WJ, Slavensky R, Manheim LM, Martin GJ. Effect of lower extremity blood pressure on physical functioning in patients who have intermittent claudication. The Chicago Claudication Outcomes Research Group. *J Vasc Surg.* 1996 Oct;24(4):503-11; discussion 11-2.

199. Regensteiner JG, Steiner JF, Hiatt WR. Exercise training improves functional status in patients with peripheral arterial disease. *J Vasc Surg.* 1996 Jan;23(1):104-15.
200. Coyne KS, Margolis MK, Gilchrist KA, et al. Evaluating effects of method of administration on Walking Impairment Questionnaire. *J Vasc Surg.* 2003 Aug;38(2):296-304.
201. Hiatt WR, Regensteiner JG, Hargarten ME, Wolfel EE, Brass EP. Benefit of exercise conditioning for patients with peripheral arterial disease. *Circulation.* 1990 Feb;81(2):602-9.
202. Le Faucheur A, Abraham P, Jaquinandi V, Bouye P, Saumet JL, Noury-Desvaux B. Measurement of walking distance and speed in patients with peripheral arterial disease: a novel method using a global positioning system. *Circulation.* 2008 Feb 19;117(7):897-904.
203. Nicolai SP, Kruidenier LM, Rouwet EV, Graffius K, Prins MH, Teijink JA. The walking impairment questionnaire: an effective tool to assess the effect of treatment in patients with intermittent claudication. *J Vasc Surg.* 2009 Jul;50(1):89-94.
204. Torrance GW. Social preferences for health states: An empirical evaluation of three measurement techniques. *Socio-Economic Planning Sciences.* 1976;10:129-36.
205. Martin J, Glasziou P, Simes R, Lumley R. A comparison of standard gamble, time trade-off, and adjusted time trade-off scores. *International Journal of Technology Assessment in Health Care.* 2000;16(1):137-47.
206. Revicki DA, Kaplan RM. Relationship between psychometric and utility-based approaches to the measurement of health-related quality of life. *Qual Life Res.* 1993 Dec;2(6):477-87.
207. Lalonde L, Clarke AE, Joseph L, Mackenzie T, Grover SA. Comparing the psychometric properties of preference-based and nonpreference-based health-related quality of life in coronary heart disease. *Canadian Collaborative Cardiac Assessment Group. Qual Life Res.* 1999 Aug;8(5):399-409.
208. Lundberg L, Johannesson M, Silverdahl M, Hermansson C, Lindberg M. Quality of life, health-state utilities and willingness to pay in patients with psoriasis and atopic eczema. *Br J Dermatol.* 1999 Dec;141(6):1067-75.
209. Badia X, Schiaffino A, Alonso J, Herdman M. Using the EuroQoI 5-D in the Catalan general population: feasibility and construct validity. *Qual Life Res.* 1998 May;7(4):311-22.
210. Green C, Brazier J, Deverill M. Valuing health-related quality of life. A review of health state valuation techniques. *Pharmacoeconomics.* 2000 Feb;17(2):151-65.
211. Puhan MA, Schunemann HJ, Wong E, Griffith L, Guyatt GH. The standard gamble showed better construct validity than the time trade-off. *J Clin Epidemiol.* 2007 Oct;60(10):1029-33.
212. Hiatt WR, Nawaz D, Regensteiner JG, Hossack K. The evaluation of exercise performance in patients with peripheral arterial disease. *J Cardiopulm Rehabil.* 1988;12:525-32.

213. Kirkwood B, Sterne J. *Essential Medical Statistics*. 2nd ed. Massachusetts: Blackwell Science Ltd; 2003.
214. Nunnally J, Bernstein I. *Psychometric theory*. 3rd ed. New York: McGraw-Hill; 1994.
215. Downe-Wamboldt B. Content analysis: method, applications, and issues. *Health Care Women Int*. 1992 Jul-Sep;13(3):313-21.
216. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004 Feb;24(2):105-12.
217. Weber R. *Basic Content Analysis*. California: Sage Publications, Inc; 1990.
218. Sandelowski M. The use of quotes in qualitative research. *Res Nurs Health*. 1994 Dec;17(6):479-82.
219. Polit D, Hungler B. *Nursing research. Principles and methods*. 6th ed. Philadelphia: Lippincott Company; 1999.
220. World Medical Association. Declaration of Helsinki: ethical principles for medical research involving human subjects. (Latest amendment october 2008; cited novemebr 2009)
<<http://www.wma.net/en/30publications/10policies/b3/index.html>>. Accessed, 1964.
221. Ashton HA, Buxton MJ, Day NE, et al. The Multicentre Aneurysm Screening Study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. *Lancet*. 2002 Nov 16;360(9345):1531-9.
222. Raynor DK, Blenkinsopp A, Knapp P, et al. A systematic review of quantitative and qualitative research on the role and effectiveness of written information available to patients about individual medicines. *Health Technol Assess*. 2007 Feb;11(5):iii, 1-160.
223. Reise JA, Sheldon H, Earnshaw J, et al. Patient Preference for Surgical Method of Abdominal Aortic Aneurysm Repair: Postal Survey. *Eur J Vasc Endovasc Surg*. 2009 Sep 21.
224. McMurray A, Johnson P, Wallis M, Patterson E, Griffiths S. General surgical patients' perspectives of the adequacy and appropriateness of discharge planning to facilitate health decision-making at home. *J Clin Nurs*. 2007 Sep;16(9):1602-9.
225. Suhonen R, Leino-Kilpi H. Adult surgical patients and the information provided to them by nurses: a literature review. *Patient Educ Couns*. 2006 Apr;61(1):5-15.
226. Pieper B, Sieggreen M, Freeland B, et al. Discharge information needs of patients after surgery. *J Wound Ostomy Continence Nurs*. 2006 May-Jun;33(3):281-9; quiz 90-1.
227. Mistiaen P, Francke AL, Poot E. Interventions aimed at reducing problems in adult patients discharged from hospital to home: a systematic meta-review. *BMC Health Serv Res*. 2007;7:47.

228. Chick N, Meleis A. Transitions: a nursing concern. In *Nursing research methodology: issues and implementation* (Chinn P ed.). Rockville Md: Aspen publishers; 1986.
229. Bridges W. *Managing transitions: Making the most of change*. Menlo Park, California: Addison Wesley; 1991.
230. Meleis AI, Trangenstein PA. Facilitating transitions: redefinition of the nursing mission. *Nurs Outlook*. 1994 Nov-Dec;42(6):255-9.
231. King JT, Jr., Tsevat J, Roberts MS. Preference-based quality of life in patients with cerebral aneurysms. *Stroke*. 2005 Feb;36(2):303-9.
232. King JT, Jr., Brandt CA, Tsevat J, Roberts MS. A national internet-based survey of cerebral aneurysm preference-based quality of life. *Neurosurgery*. 2009 Feb;64(2):249-54; discussion 54-5.
233. Izquierdo-Porrera AM, Gardner AW, Bradham DD, et al. Relationship between objective measures of peripheral arterial disease severity to self-reported quality of life in older adults with intermittent claudication. *J Vasc Surg*. 2005 Apr;41(4):625-30.
234. Lloyd AJ. The extent of patients' understanding of the risk of treatments. *Qual Health Care*. 2001 Sep;10 Suppl 1:i14-8.
235. Edwards A, Elwyn G, Covey J, Matthews E, Pill R. Presenting risk information--a review of the effects of "framing" and other manipulations on patient outcomes. *J Health Commun*. 2001 Jan-Mar;6(1):61-82.
236. van Til JA, Stiggelbout AM, Ijzerman MJ. The effect of information on preferences stated in a choice-based conjoint analysis. *Patient Educ Couns*. 2009 Feb;74(2):264-71.
237. de Vries SO, Visser K, de Vries JA, Wong JB, Donaldson MC, Hunink MG. Intermittent claudication: cost-effectiveness of revascularization versus exercise therapy. *Radiology*. 2002 Jan;222(1):25-36.
238. Altman G. *Practical statistics for medical research*. London: Chapman & Hall; 1995.
239. Lincoln Y, Guba E. *Naturalistic Inquiry*. Newbury Park, California: Sage Publications Inc.; 1985.
240. Ubel PA, Jepson C, Baron J. The inclusion of patient testimonials in decision aids: effects on treatment choices. *Med Decis Making*. 2001 Jan-Feb;21(1):60-8.
241. Hemmerich JA, Ghini EA, Schwarze ML, Dale W. Vivid bad outcome influences the decisions of older adults about treatment timing: a randomized field experiment with an abdominal aortic aneurysm analog. *Transl Res*. 2007 Sep;150(3):139-46.
242. Troeng T, Malmstedt J, Bjorck M. External validation of the Swedvasc registry: a first-time individual cross-matching with the unique personal identity number. *Eur J Vasc Endovasc Surg*. 2008 Dec;36(6):705-12.
243. Stiggelbout AM, de Haes JC. Patient preference for cancer therapy: an overview of measurement approaches. *J Clin Oncol*. 2001 Jan 1;19(1):220-30.

244. Atchison KA, Gironda MW, Black EE, et al. Baseline characteristics and treatment preferences of oral surgery patients. *J Oral Maxillofac Surg.* 2007 Dec;65(12):2430-7.

