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## On vs. Off: Coronary Bypass Surgery from a Patient's Perspective

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On vs. off: Coronary artery bypass surgery from a patient's perspective

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## Abstract

Throughout the years, technological advances have changed the face of cardiac surgery, but at times, it is a return to a previous technique, which proves beneficial. Prior to the introduction of cardiopulmonary bypass, cardiac surgery was performed on a beating heart, but due to the lack of an appropriate immobilizing device, the surgery was extremely complicated. With the introduction of new stabilization devices, immobilization of the heart has become easier and beating heart surgery has gained popularity once again. Multiple studies have been done which discuss the benefits of off-pump coronary artery bypass surgery (OPCAB), but none of the studies have explored the surgery from a patient's perspective. The patient is medicine's most important ally and as such, it is important that health care providers understand the fears, anxieties, and experiences that their patients undergo. Studies have compared OPCAB with conventional coronary artery bypass (CABG), but the patient's experience has not been explored.

The purpose of this study was to determine how people who have had both OPCAB and CABG view the surgical experience, their outcomes, and the fears they had prior to surgery. The sample was comprised of four men living independently in a small midwestern community. The sample was recruited with the help of a local cardiovascular surgeon's office. The participants were interviewed using an interview guide. Interviews were audiotaped and transcribed. Inductive data analysis was completed using the transcribed interviews as well as field notes from the researcher. From the data, eight categories and five subcategories were formed. The categories included suggestions to other patients, recommendations to healthcare professionals, preoperative preparation, medications, symptoms prior to surgery, trust in doctors, postoperative depression, and

comparisons between CABG and OPCAB. The last category was further subdivided into five subcategories, which included general comparison, subjective look of patient, length of stay, recovery period, and intubation experience.

The information gleaned from this study is of importance to nurses as well as other healthcare professionals as they work with patients before and after either type of bypass surgery. "It's a lifetime experience," and, therefore, it is important that healthcare professionals are fully prepared to care for and educate patients as their hearts are mended. The findings of this study may help to provide insight and knowledge about the patient's experience as they undergo one of these life-changing surgeries.

## Chapter One: Introduction

Throughout the years, technological advances have changed the face of cardiac surgery, but at times, it is a return to a previous technique, which proves beneficial. Prior to the introduction of cardiopulmonary bypass, cardiac surgery was performed on a beating heart, but due to the lack of an appropriate immobilizing device, the surgery was extremely complicated (Hernandez, et al., 2001). With the introduction of new stabilization devices, like the Octopus, immobilization has become easier and beating heart surgery has gained popularity once again. Multiple studies have been done which discuss the benefits of off-pump coronary artery bypass surgery (OPCAB) (Angelini, Taylor, Reeves, & Ascione, 2002; Hart, 2001; Puskas, et al., 2001; Hernandez, et al., 2001; Puskas, et al., 1998; Hirose, Amano, Yoshida, Takahashi, & Nagano, 2000), but none of the studies have explored the surgery from a patient's perspective. The patient is medicine's most important ally and as such, it is important that health care providers understand the fears, anxieties, and experiences that their patient's undergo. Studies have compared OPCAB with conventional coronary artery bypass (CABG) (Angelini, et al., 2002; Schutz, et al., 2001; Puskas, et al., 2001; Hernandez, et al., 2001; Magee, et al., 2002; Puskas, et al., 1998; Kavarana, et al., 2000; Hirose, et al., 2000; Gundry, Romano, Shattuck, Razzouk, Bailey, 1998), but the patient's experience has not been explored. This study will explore the experiences of patient's who have undergone both types of bypass surgery with the hope of helping health care practitioners to become aware of their patient's experience.

### Definitions

To fully comprehend this study and the studies that are included in the literature review, it is necessary to define the key terms.

### Angina

Angina pectoris is commonly referred to as chest pain, which is caused by myocardial ischemia. A blockage or spasm of a coronary artery, which occludes or decreases blood flow to the heart, can cause angina. Angina may be classified as stable, unstable or variant (Urden, Stacy, & Lough, 2002). Stable angina is predictable and the patient can often describe precipitating factors, whereas unstable angina is the onset of new angina or a marked change in the usual pattern of angina. Variant angina is caused by spasms in the coronary arteries and often occurs while a person is at rest. Medical management is often employed for the treatment of angina, but when medical management fails coronary artery bypass surgery is indicated (Urden, Stacy, & Lough, 2002).

### Ischemia

The word ischemia is a derivative from the Greek word "ischein" which means to hold back. Ischemia is defined as a local or temporary deficiency of blood flow due to an obstruction of circulation. In the heart, ischemia is decreased blood flow to the myocardium and can lead to angina or myocardial infarction (Anderson, Anderson, & Glanze, 1998).

### Myocardial Infarction (MI)

Myocardial infarction, commonly referred to as a heart attack, is a term used to describe a condition of irreversible ischemia of the heart, which causes myocardial necrosis (cell death). An MI is the most life-threatening cardiac condition (Urden, Stacy, & Lough, 2002).

### Coronary Artery Disease

Coronary Artery Disease (CAD) is the number one killer of men and women in the United States. CAD is the result of atherosclerotic lesions that develop in the coronary arteries.

These lesions eventually obstruct blood flow to the coronary vessels (Blacks, Hawks, & Keene, 2001).

### CKMB Isoenzymes

Creatinine kinase (CKMB) is a blood test done to determine if the myocardium has been injured. Cardiac markers are proteins released from dead or dying cardiac tissue, and CKMBs are used to help diagnose acute myocardial infarctions or to determine the extent of a cardiac disease. Most cardiac enzymes are retested for three days in succession to determine clinical significance (Fischbach, 2002).

### Myocardial Revascularization

Myocardial revascularization is the use of a conduit, usually the saphenous vein or internal mammary artery, to bypass an occluded coronary artery. The right gastroepiploic artery is an alternate conduits, but it has only recently been introduced, although studies have shown excellent patency rates. The radial arteries can also be used. (Urden, Stacy, & Lough, 2002).

### Coronary Artery Bypass Surgery (CABG)

CABG is a surgical procedure in which an occluded artery is bypassed by use of an alternate conduit. The surgery is performed in patients with angina that cannot be controlled via medical management, such as antiangina medications. The results of CABG show excellent graft patency and symptom reduction. Bypass surgery has also shown more complete revascularization rates than medical management (Urden, Stacy, & Lough, 2002).

### Cardiopulmonary Bypass (CPB)

Cardiopulmonary bypass is a means of circulating and oxygenating a patient's blood during cardiac procedures. The patient's blood supply is diverted to an oxygenator, which oxygenates the patient's blood and then pumps the arterialized blood back into the patient.



During this procedure, systemic hypothermia is used to reduce tissue requirements up to 50%. The body temperature is lowered to approximately 28°C (82.4°F) by lowering the temperature of the blood before it is returned to the patient. The blood is then rewarmed prior to discontinuing the bypass. The patient is given heparin, an anticoagulant, to prevent the blood from clotting within the bypass machine. The blood that remains in the bypass circuit after termination can then be collected and used for initial fluid replacement in the postoperative period (Urden, Stacy, & Lough, 2002).

### Cardioplegia

During on-pump coronary artery bypass surgery, it is necessary to intentionally stop the heart from beating. Cardioplegia is a purposeful, transitory arrest of cardiac function that is initiated by hypothermia, chemicals, or electrical stimuli (Anderson, Anderson, & Glanze, 1998).

### Endotracheal Tube

The endotracheal tube is the most commonly used short-term artificial airway and is commonly placed through the mouth into the trachea. The tubes are made in a variety of sizes. The endotracheal tube provides an artificial airway for ventilator support, protection from aspiration, facilitation of suctioning the lungs, and the use of high concentrations of oxygen (Urden, Stacy, & Lough, 2002).

### Intubation

Intubation is the placement of an endotracheal tube to facilitate breathing in a client who is unable to breathe adequately on his/her own (Urden, Stacy, & Lough, 2002).

### Extubation

Extubation is the removal of an endotracheal tube once it is no longer needed to assist a patient in breathing (Urden, Stacy, & Lough, 2002).

### Off-Pump Coronary Artery Bypass Grafting (OPCAB)

OPCAB is a form of myocardial revascularization that does not require the heart be stopped as in conventional coronary artery bypass surgery. A vertical incision is made and the breastbone is split as with conventional CABG, but the heart lung machine is not used and cardioplegia does not occur. A stabilizing device such as an Octopus is used to restrict the movement of small segments of the heart so that the surgeon can operate while the heart is still beating (Stewart, 2002).

### Octopus

The "Octopus" stabilization device created by Medtronic is used to stabilize a coronary anastomosis site by decreasing tissue movement to 1x1x1 millimeter. The device suctions to the heart, and can be moved and repositioned multiple times to aid the surgeon in stabilization and visualization (Utrecht University Medical Center, 2001).

### History

Over the years, multiple studies have been done to advance the knowledge of cardiac surgery. As coronary artery bypass surgery developed, many changes took place to make it easier for the patient and the surgeon. With the development of cardiopulmonary bypass, bypass surgery performed on the beating heart was not used as often due to the complexity of the procedure (Buffolo, Andrade, Succi, Leao, & Gallucci, 1984). By inducing cardioplegia, the heart is much easier to operate on because the surface is immobile and hemodynamic stability is not as much of an issue as it is when the heart is being manipulated while beating. As early as the 1950s, Murray was developing surgical techniques using lab animals to advance the field of cardiac surgery (Murray, Porcheron, Hilario, & Roschlau, 1954). The first human bypass of the right coronary artery without cardiopulmonary bypass using a saphenous vein graft was

performed in 1962 by Sabiston (Benetti, 1985). Since the beginning of modern cardiac surgery, multiple advances have been made and the use of cardioplegia with cardiopulmonary bypass has become the standard. The technique of cardioplegia with cardiopulmonary bypass has been proven effective in numerous studies, but the risks are also well documented (Benetti, 1985; Buffolo, et al., 1984). During the 1980s, surgeons began to revive the technique of coronary artery bypass grafting without the use of cardiac arrest or cardiopulmonary bypass. The technique of operating on the beating heart requires a very high skill level on the part of the surgeon, but provides numerous patient benefits.

Studies performed by researchers in the 1980s clearly document the benefits of off-pump coronary artery bypass surgery (OPCAB). In 1985, Benetti published a research article in which he discussed the benefits of OPCAB. He found that graft patency was excellent, the patients were extubated within three hours after surgery, recovery time was faster and hospitalization was shorter than with conventional coronary artery bypass surgery (CABG) (6.1 days as compared to 11.4), inotropic drugs were not used, and the patients were able to walk within hours after surgery. Another study published in 1985 by Buffolo, Andrade, Succi, Leao, and Gallucci had similar findings. Their study determined that hospital stay was shortened in the OPCAB group (7 days for OPCAB and 11 days for CABG). CKMB isoenzyme studies obtained during the first twenty-four hours after surgery demonstrated no myocardial damage. This study also determined that intraoperative time was shorter when no cardiopulmonary bypass was used. Early studies have concluded that OPCAB has serious limitations, but presents a valid alternative to conventional coronary artery bypass grafting with cardioplegia and cardiopulmonary bypass (Benetti, 1985).

## Chapter Two: Literature Review

As a precursor to any research, it is important to search the current research base to determine if the research, which is about to be embarked upon, is necessary. The literature reviewed for this particular research was mainly medical research due to a lack of nursing research. CINAHL and Medline were the databases used to find current research articles on the benefits and outcomes with off-pump coronary artery bypass (OPCAB). Multiple searches were done using terms such as "coronary artery bypass surgery" and "off-pump coronary artery bypass surgery." Advanced searches were then performed limiting the date of the articles from 1998-present and the content to outcomes research regarding length of stay, morbidity, and surgical complications. No nursing or qualitative literature was found so the medical literature was subsequently searched.

Ten articles, which fit the search criteria, were chosen and reviewed by the researcher. The articles were informative, but repetitious as many of the articles had the same general conclusions. The findings of the articles will be summarized in the following with a general summation of all of the articles at the end.

Angelini, Taylor, Reeves, and Ascione (2002) performed a meta-analysis of two studies done previously by the same authors. The two studies were very similar and differed only in the inclusion criteria for OPCAB in that the first study did not include patients who had had a myocardial infarction within thirty days. Due to the advancement of techniques, the second study did include patients with recent myocardial infarcts. These studies found that patients who underwent off-pump surgery had a decreased risk for a greater than one day stay in the intensive care unit and a greater than seven day hospital stay. They also found that the off-pump technique significantly decreased in-hospital morbidity in the first one to three years. The studies used for

this meta-analysis found that graft patency in OPCAB were comparable to that of conventional coronary artery bypass grafting (CABG).

Conventional cardiac surgery with the use of cardioplegia has been speculated to have many negative consequences especially on the aging population (Hart, 2001). In a study of 140 elderly patients, Hart found that OPCAB might be the surgery of choice for the aging population. He reports that myocardial protection was excellent with patency rates being equal to or better than those of conventional cardiac surgery. All of the surgeries were performed by the same surgeon, using the same types of instruments. Fewer postoperative complications were noted including no patients experiencing postoperative stroke, and very low rates of atrial fibrillation (17.1%), confusion (4.2%), and renal failure (0.7%). The author admits that some selection bias may have occurred early in the study because patients with circumflex artery disease were more likely to have a conventional CABG due to the difficulty maintaining hemodynamic stability. There was also no control group for this particular study. Dr. Hart does conclude, however, that OPCAB has been proven safe and effective and should be considered for elderly patients at high risk for complications.

Schutz, Mair, Wildhurt, Gillrath, Lamm, Kilger, and Beichart (2001) performed a smaller scale study on forty patients who were scheduled for redo coronary artery bypass grafting. Of the forty patients, twenty had OPCAB and twenty had CABG. The patients in each group did not differ significantly in ventricular, renal, or liver function. Though the duration of surgery did not differ significantly between the groups, the authors found that many other significant differences did occur. The time until extubation was longer with CABG ( $p < 0.001$ ), and the length of stay in intensive care was also significantly longer ( $p < 0.001$ ). Significantly more epinephrine had to be used to maintain MAP greater than seventy-five mmHg in the CABG

group ( $p < 0.01$ ), and CKMB levels were lower in the OPCAB group ( $p < 0.001$ ). The authors found that myocardial cell damage was high in the CABG group, hence the increased CKMB, and that the weight of the patients in the CABG group increased after surgery representing a change in vascular permeability. Because ischemia is intermittent in the OPCAB group myocardial cell damage is reduced, which causes a reduction in inotropic support, intubation time, and intensive care stay.

In another study, two hundred OPCAB patients were matched according to other conditions with over one thousand CABG patients who acted as a control group (Puskas, et al, 2001). This study used a retrospective approach. The cross-matched groups differed only in incidence of previous myocardial infarction. The number of grafts performed in the two groups differed significantly with  $2.5 \pm 1.1$  in the OPCAB group and  $3.7 \pm 1.0$  in the CABG group. This difference likely accounts for the selective referral of patients to undergo OPCAB. This study found a significant difference in perioperative transfusion rate between the two groups. In the OPCAB group, 33% of patients underwent transfusions, whereas in the CABG group, 70% required transfusion of some type of blood product ( $p < 0.001$ ). The authors also found that there was a decrease length of stay with the OPCAB group ( $p < 0.001$ ), and a 15% decrease in hospital cost ( $p < 0.001$ ). This study concluded that length of stay, hospital cost, and morbidity decreased with OPCAB, while maintaining safety and effectiveness.

Hernandez and colleagues (2001) used a multicenter approach to collect more data regarding in-hospital outcomes with OPCAB versus CABG. The two groups of patients did have demographic differences, but none that significantly affected the baseline data when the differences were compensated for. The rates of mortality, stroke, mediastinitis, and return to the operating room for hemorrhage did not differ significantly between the two groups; however,

some statistical significance existed in other variables. Patients undergoing OPCAB did have significantly lower rates of Intraaortic Balloon Pump insertion ( $p=0.023$ ) and lower rates of atrial fibrillation in the postoperative period ( $p<0.001$ ). The postoperative length of stay was also significantly lower in the OPCAB group ( $p<0.001$ ). This study determined that with regards to short-term outcomes, OPCAB is as safe and effective as traditional CABG with cardiopulmonary bypass and cardiac arrest, but further studies are needed to determine the long-term clinical outcomes (Hernandez, et al., 2001).

The purpose of another study was to determine the impact of cardiopulmonary bypass on early survival rates (Magee, 2002). All of the patients in this study had multivessel bypass surgeries at one of two major medical centers. The retrospective analysis was done using large databases to cross-match preoperative risk factors in the patients. The institution specific selection criteria for OPCAB did differ, but the differences were defined and compensated for. The results of the study were applied to the statistical model to correct for selection bias between the two institutions. After the results were corrected, many significant differences still existed, which had also been present in the crude results. The patients who underwent CABG were 1.9 times more likely to die than the patients who underwent OPCAB; using a univariate comparison it was found that the mortality rate was higher in the CABG group ( $p=0.002$ ). The OPCAB group also had a decreased risk of complications including: reoperation for bleeding, blood transfusion, prolonged ventilation, and renal failure. This study was limited in that each of the contributing institutions had different requirements for OPCAB, but every effort was made to minimize the selection bias.

Puskas and colleagues published a study in 1998, which found that OPCAB avoided many of the short-term deleterious effects of CABG with cardiopulmonary bypass. In this study,

fifty-one patients undergoing OPCAB were matched with two hundred forty-eight patients undergoing CABG. The groups had no significant differences preoperatively and were matched by age, sex, and seven different comorbidities. No stroke, myocardial infarction, or reentry for bleeding occurred in the OPCAB group. Significant differences existed in the length of stay ( $p=0.01$ ), blood transfusions ( $p=0.0001$ ), and hospital charges ( $p=0.05$ ). The grafts in the OPCAB were also found to be widely patent with only one out of forty-three completely occluded and one other occluded 50%. This study found that multivessel disease was treated safely and effectively with OPCAB with excellent results (Puskas, et al., 1998).

Complications with conventional CABG are multifactorial and evasion of cardiopulmonary bypass may not necessarily translate into a clinical benefit. Kavarana et al (2001) performed a retrospective study of two hundred thirty-eight patients who underwent either OPCAB or CABG between July 1998 and July 1999. Medical charts were used to collect data about length of stay, preoperative risk factors, age, postoperative complications, and operative findings. There was no selection bias or patient exclusion. All cohorts were well matched for age, sex, and preoperative risk factors. Kavarana and colleagues (2001) found multiple significant results ( $p < 0.05$ ); including shorter length of stay in the intensive care unit ( $p=0.004$ ) and shorter hospital stay ( $p=0.006$ ). Shorter skin-to-skin operating times were approaching significance ( $p=0.07$ ). This study concluded that while they found many important significant conclusions, more trials are needed before OPCAB can be proclaimed an indispensable advance over CABG.

In some institutions, OPCAB has only recently been introduced and in those places the use of OPCAB is still limited. Hirose, Amano, Yoshida, Takahashi, and Nagano (2000) reported their one-year experiences with OPCAB. A retrospective analysis was performed, and selection



bias was present. OPCAB was done on patients with less than two bypasses needed, unless comorbid conditions made it necessary to perform OPCAB on patients with three-vessel disease. The patients in the study who underwent OPCAB had no incidence of stroke or dialysis in the postoperative phase, but the results did not reach significance. The authors feel that a multicenter trial of OPCAB is needed to further explore the usefulness and benefits of OPCAB.

Gundry, Romano, Shattuck, Razzouk, and Bailey (1998) did a seven-year follow-up of patients who underwent OPCAB. The authors found that patient survival and cardiac death rates were similar, but the patients in the OPCAB group had twice as many recatheterizations and twenty percent needed a second intervention. The surgeries in this study were performed from June 1989 to July 1990, and the authors admit that with new technologies and advanced techniques and instruments, the outcomes with OPCAB may have improved. The technique used in this study to stabilize the heart was taping the vessels, and the authors stated that this technique might have caused excess damage to the myocardial tissue. The conclusion of this research was that longevity and symptomatic status was comparable in the CABG and OPCAB groups seven years after the initial intervention. The OPCAB group did have more reinterventions, such as recatheterizations, than the CABG group, but with new advances this finding may have changed since the time of these surgeries.

Although few large, randomized trials have been performed, the literature clearly shows the benefits of OPCAB. The quantitative literature supports the notion that OPCAB is beneficial for many patients, but gaps in the literature still exist. Few prospective or longitudinal studies have been performed (Gundry, Romano, Shattuck, Razzouk, & Bailey, 1998), and no qualitative studies have explored the experiences of patients who have undergone OPCAB. The consensus among the articles was that length of stay in both the ICU and the hospital was decreased by

avoiding cardiopulmonary bypass and cardioplegia (Angelini, et al., 2002; Schutz, et al., 2001; Puskas, et al., 2001; Hernandez, et al., 2001; Puskas, et al., 1998; Kavarana, et al., 2001).

Though the studies found many benefits of OPCAB, some authors were hesitant to make any positive correlations between the avoidance of cardiopulmonary bypass and positive clinical outcomes due to the possibility of other causative factors (Karavana, et al., 2001). Two studies documented that the performance of coronary artery bypass grafting without the use of cardioplegia or cardiopulmonary bypass may be beneficial in high risk groups including the elderly and people with multiple comorbid conditions (Hart, 2001; Puskas, et al., 1998).

Although some studies admitted to selection bias due to the inability to perform OPCAB on certain arteries, many attempted to compensate for bias (Angelini, et al., 2002; Hart, 2001; Magee, 2002; Hirose, et al., 2000). Karavana and colleagues (2001) performed a randomized study with no selection bias, but suggested that their study be followed up by other studies of the same nature, which was also the suggestion of every other study in this review. The literature regarding comparisons of OPCAB with CABG is inadequate to determine if OPCAB should become the surgery of choice, but the results of the studies reviewed seem to agree that OPCAB has its place in cardiac surgery. Although longitudinal and qualitative studies need to be done to fully explore the benefits of OPCAB, they appear to be numerous including: decreased length of stay, decreased cost, and decreased in-hospital mortality.

## Chapter Three: Methodology

### Recruitment and Sample

During September of 2002, contact was made with a midwestern cardiovascular surgeon's office. After providing the office with IRB approval and information about study, the nurse and the cardiovascular surgeon began contacting patients who had had both on and off the pump coronary bypass surgery. The office nurse called six patients and discussed the study with them. She then received verbal approval to forward their name and contact information via e-mail. After receiving names and phone numbers, possible participants were contacted to explain the study and to see if they would be willing to participate. The possible participants were informed of the purpose of the study and that the meeting would be done at their convenience. Of the possible participants, two did not want to participate, two wanted to meet in the cardiovascular surgeon's office, and two wanted to meet in their home. Appointments were made to meet with each of them at the place they felt most comfortable and interviews were completed during November and December 2002.

All of the names that the office nurse provided were Caucasian males and they all corresponded to the inclusion criteria. The only inclusion criterion was that the participants had to have experienced both on and off the pump coronary artery bypass surgery in their lifetime. As long as the people fit this category they could be included in the study. The sample size was limited to three to five people due to the researchers time constraints and nature of the study.

### Data Collection

The data was collected via face-to-face interviews with each of the participants and their wives, if applicable. Each interview lasted forty-five minutes to an hour and fifteen minutes, and an interview guide was utilized. The participants were asked to sign an informed consent form and fill out a demographic data questionnaire prior to beginning the interview. The demographic

data questionnaire and interview guide were adapted from Dr. Susan Swanlund's doctoral thesis with her permission. The questionnaires and transcription were coded using "M" for male followed by a dash and the number of the interview. Each interview was tape recorded and subsequently transcribed by the researcher. After the interviews were transcribed, four copies were printed for data analysis. Though only four interviews were completed, saturation of the data was established in that each of the interviewees provided very similar information and by the fourth interview very little new information was discovered.

### Reliability and Validity

To ensure reliability and validity, the researcher took field notes during each of the interviews and referred to the notes during data analysis. The demographic data questionnaire had been previously used by Dr. Susan Swanlund (1998), and the interview guide was also adapted from the one used in Dr. Swanlund's doctoral thesis.

### Data Analysis

Data was analyzed by the researcher and her faculty advisor using methods described by Lincoln and Guba (1985). The information was read multiple times to become familiar with the data set. The first time the data was read; the second time marginal comments were made; the third time, data was entered on note cards; the fourth time, the focus was on distinct words that the participants used and quotes that would flesh out the information already entered on the note cards. The pieces of information and quotes that were placed on note cards were coded on the back using the participants code and the line number from which the information came. Once the data had been entered on the note cards, it was categorized according to broad categories that the researcher discovered. The categories were reworked and broken into subcategories during the ensuing weeks until confidence was gained that categorization was complete.

## Chapter Four: Data Analysis

After data collection was complete and the researcher was satisfied that a sufficient amount of data had been collected, analysis began using methods described in Lincoln and Guba. Once all of the data was entered on note cards, categorization began. Eight major categories were identified and one category was broken down into five subcategories due to a wealth of information. The categories were symptoms prior to surgery, preoperative preparation, trust in doctors, medications, postoperative depression, suggestions to other patients, recommendations to healthcare professionals, and comparisons between CABG and OPCAB. The last category was further subdivided into five subcategories including general comparisons, subjective look of patient, length of stay, recovery period, and intubation experience.

### Characteristics of Patient

The sample consisted of five men ages 56-72 years who had experienced both on and off the pump surgery. Each participant was asked to fill out a demographic data questionnaire prior to the interview, but was told that they were not under any obligation to provide information that they did not feel comfortable providing. Table I delineates various characteristics of each of the study participants.

Table I: Demographic Characteristics of Sample

	<b>M-1</b>	<b>M-2</b>	<b>M-3</b>	<b>M-4</b>
<b>Age</b>	71	72	56	69
<b>Gender</b>	Male	Male	Male	Male
<b># of Years Between Surgeries</b>	10 years	11 years	9 years	19 years
<b>Level of Education</b>	2 years of college	12	Associate's Degree	Master's Degree in Math
<b>Income level</b>	--	25,000-49,000	50,000-74,000	75,000-100,000
<b>Marital Status</b>	Married	Married	Married	Widower
<b>Rating of Health</b>	Good	Fair	Good	Good

The participants were all Caucasian males, but their age, income level, level of education, and number of years between surgeries varied significantly.

### Symptoms Prior to Surgery

“I’d be mowing the grass and I’d have to stop because I couldn’t [takes a deep breath] really breathing heavy and I’d stop for a minute...that’s when it all went to hell in a handbag.” Fatigue, weakness, shortness of breath, and heaviness in the chest are all signs of heart problems, but most people equate only chest pain to heart problems. With the exception of one man having a heart attack days prior to his bypass surgery, none of the participants ever experienced chest pain or the typical symptoms associated with a heart attack or heart problems. Each of the men described shortness of breath and fatigue as the main reasons they went to the doctor. “I got tired easy. I went into my doctor and I says if old age is like this I don’t want any part of it and that’s when she started giving me tests.” One participant indicated that he had no symptoms prior to his second surgery, but then stated that he was out of breath a lot. “I mean I was getting out of breath a lot I guess I just didn’t really think about it, but I realized that uh yeah...after I found out what was wrong yeah ok I understand now why, then coming out of surgery I felt a lot better.”

This knowledge deficit related to the symptoms of heart disease should be alarming to healthcare providers. If the public was informed regarding the symptoms of heart disease, some heart attacks and sudden cardiac deaths may be prevented by early intervention. Fatigue, weakness, and shortness of breath are not typically associated with heart problems by the general public. Heart disease is the leading cause of the death in the United States, and it is time to educate the public so that they can recognize the symptoms of heart disease and seek prompt medical attention.

### Preoperative Preparation

Prior to the first bypass surgery, the participants indicated that they had a knowledge deficit. Most of them knew very little, if anything, about the surgery and some did not want to be informed. Visual aids are a common teaching method of patient education that is widely utilized and the participants indicated that videos and diagrams of the blockages were helpful in increasing their understanding. A video was shown to each of the participants and their families prior to their on-pump surgery and they indicated that the video was a beneficial teaching strategy. One of the participants did not watch the video because he did not want to know what was going to happen. The wives were especially positive about the video and stated that it gave a good explanation of the devices that they would see in use after the patient came out of surgery. Although the video showed a postoperative patient, the wives indicated that no video can truly prepare someone for what a patient will look like after on-pump bypass surgery. Three of the four participants had their on-pump operation at St. John's in Springfield, IL, which would explain why their preoperative teaching was very similar. One of the wives also stated that St. John's offered classes for the families about heart healthy diets and exercise, which she found very helpful.

When asked whether preoperative teaching was adequate, many of the participants could not answer because they did not know what adequate really was. Many stated that prior to the surgery they never truly knew that they were making the correct decision in deciding to have the surgery. One participant stated that he did not know if it was adequate, but "it was, you know, no brainer, you're going to go down this road very quickly and uh this is going to happen to you or you can take a chance and you'll have a full life after that and that's the way it worked out."

### Trust in Doctors

“I think you do need to trust your doctor.” “You’ve gotta believe in your doctor.” “If you just put your faith in your doctor and in God then you’ll make it through.” “I was just having faith...faith in the doctors, faith in my religion and that was it.” Each of the participants cited trust in the doctors as something of utmost importance. Most of these gentlemen did not know their surgeon until a day prior to the surgery, but the way that the surgeon portrayed himself gave the participants confidence in his surgical ability.

### Medications

All of the participants were on multiple prescription medications, but all of them stated that prior to their on-pump surgery they were on no medications. They did not know exactly how their medications had changed after each of the surgeries, but knew that medications were added and subtracted throughout the years. Each of the participants provided a list of their medications or knew what they were on, except for the participant who was a widower and he only knew what they medications did, not the names or dosages. All four of the men were on aspirin and a medication to control high cholesterol. Three of the four were on Atenolol as well, and all four stated taking some type of vitamin daily.

### Postoperative Depression

Three of the four participants described experiencing some form of depression after their surgeries. One of the men described his depression as mild and stated that it was not any worse after one surgery than the other. After his on-pump, he experienced some memory loss and thought that this could be the cause of the depression. Prior to the OPCAB, he had experienced significant life changes including a death in the family and moving to a new town so he felt that those life changes coupled with the surgery could have caused the depression. The other two



participants experienced depression after their on-pump surgeries, but not the OPCAB. One participant recollected that “everything hurt,” he developed insomnia, and was “very unhappy.” His wife remembers that depression “was probably the longest repercussion.” Another participant’s wife remembers “there were some days I could walk across the room and I couldn’t do it right...I really think that once your heart has been, what do I want to say you’ve had a bypass or you’ve had problems and you’re on a lot of medications that your moods do change.” She remembers that their children noticed his mood swings and that his demeanor was not the same as before surgery. Three of the four participants experienced depression in some form or another after the on-pump surgery, and only one of these remembers any depression after the OPCAB. One participant, the youngest, stated that he did not experience depression after the CABG or OPCAB procedure.

#### Suggestions to Other Patients

When asked what type of advice they would give to people who were about to undergo bypass surgery each participant had a slightly different feeling about the issue, but they were all in agreement that OPCAB was the best procedure to have if a choice was offered. “Off-pump. There’s no question.” One participant even stated “if you’re going to go on the pump god bless you, I mean they’re still doing it, but it’s so much easier off the pump it’s unbelievable.” Three of the four participants stated that listening to the doctors and nurses was a very important part of having a successful procedure. The participants felt that it was very important to always listen to healthcare providers because they knew what they were talking about. One of the wives stated that asking questions and developing a full understanding of the procedure was key. She also advised family members to pray and go off-pump if at all possible.

Besides recommending OPCAB, prayer, and listening to the healthcare professionals, two of the men stated that talking to someone who has been through the procedure is very helpful. By speaking to someone who has already been through the surgery, the men felt that they were able to gain insight into what they were going to experience. One man stated that he felt bypass survivors could be very useful to doctors because they could provide support and counseling to people who were trying to decide whether bypass surgery was a good option. He had had the opportunity to speak with a friend regarding bypass surgery, and his friend's family later told him that he was the person who had been the deciding factor in the man deciding to have surgery. His advice was simply "what do you got now? What do you got a chance for? And that's it, there you go."

#### Recommendations to Healthcare Professionals

Education is an important piece of the medical profession, and sometimes healthcare professionals may not realize what type of education is necessary. One participant stated that he feared addiction to pain medications after his on-pump bypass surgery, and, therefore, did not take the prescribed medication. He stated "I would sit at the table and I'd bawl and I told mother maybe I did the wrong thing. Maybe I shouldn't even had the operation." By educating people regarding utilization of pain medication situations such as this could be avoided. He reported having less of a problem after his OPCAB because he was instructed to utilize the pain medications and avoid letting the pain become overwhelming. He was told that he would not become addicted and that controlling the pain was an important step toward recovery.

"Keep it simple." A person undergoing bypass surgery is not a candidate for an indepth teaching session including medical terminology and detailed explanations. When a patient finds out that he/she has to undergo bypass surgery fear of the unknown and anxiety are common

emotions. These patients and their families are apprehensive so it is important to provide teaching using simple, concise explanations without complex medical jargon. Two of the participants stated that the thing they wanted to hear was that the surgeon had performed the operation multiple times. "I think it sort of gives you self-confidence." Patients want to know that their surgeon is skilled and that they are not the first patient that this surgery has been performed on.

Another important piece of advice is to keep the family informed. Whether the news was positive or negative the wives reported wanting to know what was going on at all times. Each of the wives stated that the hospitals were very good about keeping them informed about the condition of their husband, and what was going on during the surgery. One of the wives was thankful that the doctor was straightforward with her about her husband's critical condition.

#### Comparisons between On and Off Pump Coronary Artery Bypass Surgery

Due to the large size of this particular category, it was advantageous to further divide it into subcategories. Five subcategories were found and they were general comparisons, subjective look of patient, length of stay, recovery period, and intubation experience.

##### *General Comparisons*

"It's like a horse and a car trying to get to a certain point, that's how much different it is." The aforementioned quote is one man's explanation of the difference between on-pump and OPCAB. All of the participants stated, in various ways, that OPCAB was much easier than on-pump. Here's a sampling of their feelings:

"It was like, like I had my appendix out."

"It's so much easier off the pump it's unbelievable."

"It was so much easier [OPCAB]...other than I had a real sore chest [laughs]...I was, I

was functional.”

“I think the second one [OPCAB] did go you know a lot better than the first one...”

“I was in at 2, came out at 8...I was aware of things going on to the point that...uh...I asked (my son) who won the basketball game, uh...2 o'clock in the morning that's actually 12 hours after I went in, not 12 hours after the operation, some nurse came in and said get up, sit at the side of the bed...”

The main points about OPCAB that were made were less tubes, fewer IVs, no intubation after surgery, and dermabond instead of staples. The participants all indicated that OPCAB was so much “better” or “easier” than on-pump. Some of the participants did, however, indicate that it could have been the ten years between the two surgeries and advances in technology that helped to improve their outcomes.

#### *Subjective Look of Patient*

The three participants whose wives came with them each described the look of their husband after the surgery. After the on-pump operation, the wives described the bloated appearance and stated that it was very similar to the video that they had been shown prior to the operation. “It was pretty much like that movie they showed us with the bloateness and the tubes in and he was not recognizable at all...” Though the movie had attempted to prepare the families for what they were going to see, each felt that it was different when a family member was lying in the bed. After OPCAB, the families reported a significant difference in appearance of their family member. “Well he had some tubes, um they did it differently of course. He was sitting up in a chair more...he was somewhat bloated, but not grotesque as he was before.” Grotesque is a very strong word to describe a loved ones appearance, but after an on-pump surgery the family member is bloated, gray, and unrecognizable. This appearance coupled with a ventilator

and multiple tubes makes the family member look hideous. After OPCAB, however, there are fewer tubes and appliances, and the patient does not have such a moribund appearance.

#### *Length of Stay (LOS)*

LOS is considered an indicator of many things including cost-effectiveness of new operations and procedures. The participants in this study indicated that their LOS for the on-pump surgery was ten to sixteen days. The participant who was in for sixteen days, however, had multiple complications due to having nasal surgery only hours before he experienced a heart attack and had to have bypass surgery. The average LOS for on-pump was ten days. The LOS for OPCAB varied between three and a half to seven days. Each participant had experienced different complications after the surgery ranging from no complications to a mild fever to a collapsed lung. None of the participants who had experienced complications placed any blame on the doctor or hospital staff. After both of the surgeries the men were discharged home to the care of family members. The wife of the participant who was discharged three and a half days after his OPCAB indicated that she may have felt a little overwhelmed the first day he was home. That participant and his wife did indicate, however, that they may have been comparing his LOS after on-pump to his LOS with OPCAB and that may have been why it seemed too short. All of the participants were released from the hospital in a significantly shorter time period with OPCAB than with CABG.

#### *Recovery Period*

All of the participants indicated that they recovered more quickly after OPCAB, but all indicated that they were able to regain their independence after each of the surgeries. The rehabilitation was described as being very similar, but the time that the participants spent in each phase of rehabilitation and the time it took them to enroll varied between the surgeries. One man

stated that he did not even enroll in rehabilitation for two months following on-pump due to pain and depression. One participant stated that it took him six weeks to recover after each of the surgeries, but after his on-pump surgery he did not want to do anything. Within three weeks after the OPCAB, one of the participants indicated that he had gone back to work part-time. After OPCAB one of the other participants indicated that he was living alone and fully functioning two weeks after the surgery. He also reported that he felt that it took longer to regain his strength after on-pump. "I did recover a lot quicker [after OPCAB]. Number one, I got out of the hospital quicker, I felt so much different." "The second one [OPCAB] went so much faster. I was out of bed that first day, actually had the surgery and I recovered faster." One participant even stated that less than two weeks after his OPCAB he attended his son's wedding in Georgia. "There it is a good example of a difference in operations. I had it done lets say on the 8<sup>th</sup> of September and my son got married on the 21<sup>st</sup>, 20<sup>th</sup>, or the 21<sup>st</sup> of September in Georgia and I went. I should tell you we went. She drove, (the doctor) said you can go but she drives...I danced with the bride, just one dance and that was it...we were there til the end." Not only were these men discharged from the hospital more quickly, they were functioning, dancing, and enjoying life.

### *Intubation Experience*

It is very common after OPCAB to extubate the patient in the operating room whereas on-pump patients are typically on the ventilator for hours after surgery. Though the participants could not all remember whether they were still intubated upon leaving the operating room after OPCAB, most of the wives remembered that they had not been. One gentleman, in regards to OPCAB, stated "I know that they had a tube in me because my throat was dry, but when I woke up at 8 o'clock the tube was gone..." The same gentleman also recollects "basically I woke up,

well I didn't really wake up for about 3 days [after on-pump]...I was in and out. Uh, I had the tubes in my mouth, there was no way to communicate, uh we did have some family hand signals." Most of the men who remembered intubation remembered being terribly uncomfortable and fighting the tube. Those who were intubated for any length of time do not remember very much about the immediate postoperative period after their on-pump surgery.

## Chapter Five: Discussion

### Nursing Implications

This research has taken the beginning steps to understanding what patients experience when undergoing on and off the pump coronary artery bypass surgery. Although quantitative data is very important when evaluating various surgical techniques, it is also vital that healthcare professionals realize how different procedures affect the patient. Each research participant gave his open, honest, and full opinion regarding his surgical experience and how it affected his life. This information can be used by healthcare providers to more fully comprehend how the surgery will affect each patient as well as their significant others and family members. By incorporating the suggestions of the patients into preoperative teaching, healthcare providers can work to effectively reduce the knowledge deficit that exists and may be able to better prepare the patient and family for the life changing experience they will undergo. The use of visual aids like videos and diagrams of the heart were helpful for the patients as well as overall simplification of the explanations.

“It’s a lifetime experience” stated one participant when describing bypass surgery, and it seems that healthcare professionals do not always address the human aspect of a procedure. The surgery may repair an ischemic heart, but it is also going to greatly affect the life of the patient, and this life changing aspect should be addressed during preoperative and postoperative teaching.

### Limitations

This research is not meant to make a generalization about how every patient will react to the two surgical procedures. Its purpose is to explore the feelings of four individuals and identify if any similarities exist. The sample size was a limitation because only four people were



interviewed, and the sample was based on convenience. The sample was also comprised of only males, which makes any generalizations very difficult. One other limitation was that the four interviews did not take place in the same location. Two of the interviews were done in the participants' homes and the other two were done at the cardiovascular surgeon's office. The choice of location was left up to the participant.

#### Recommendations for Future Research

Future studies should include a larger sample including both men and women from various backgrounds and educational preparation. Future studies should also follow-up on postoperative depression to determine whether an increase in depression was due to a conventional CABG or if it was due to the patient's first bypass experience. A comparison of first and second time OPCAB would also be an interesting undertaking to explore whether differences exist for people undergoing the surgery for the first time as opposed to the second time. In the distant future, triangulation of qualitative and quantitative findings would greatly enhance the knowledge base as well.

#### Summary

This study explored the experiences of four men who underwent both on and off the pump coronary artery bypass surgery. Each of the participants had a unique story to tell, and was completely honest about his feelings. Though not meant to generalize, this study can be used to enhance current knowledge of bypass surgery, and the participant's recommendations can be used to enhance patient care standards. The men provided useful insight into the patient's experience, and identified areas in which healthcare professionals need to improve, such as preoperative teaching. The knowledge deficit that these men identified overlapped greatly and the areas of deficit can be used to improve preoperative and postoperative teaching so that

patients and their families are more fully prepared for the surgical experience. Patients undergoing bypass surgery should be treated as holistically as possible so that they can be fully prepared for the lifetime experience which they are about to endure.

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### Informed Consent

In signing this form, I am agreeing to be interviewed by Ann Steele, a senior at Illinois Wesleyan University, as a part of her Research Honors Project. I understand the nature of this project, and, with sound mind, agree to participate. I understand that my agreement or disagreement to participate will in no way affect the health care I receive, and that commitment to participate is completely voluntary. I realize that I can revoke my commitment to participate at any time.

I agree to have Ms. Steele in my home for an interview that will take approximately one hour. After the initial interview, I will not be contacted again and my participation will be completed. Participants are not at considerable risk as the information being requested is not of a serious nature. I realize that I may release feelings about the surgery, which had not been previously discussed, and if the unexpected feelings are released I realize that Ms. Steele will spend time debriefing me and make referrals to the appropriate community agencies. I may benefit from being able to talk openly about the surgical experience and from gaining insight into my own feelings. I will also be able to ask questions openly about the surgeries and gain information about community resources.

The purpose of this research is to explore the experiences that I, the participant, have about off- and on-pump coronary artery bypass grafting. There will be 3-5 participants of varying ages, races, and genders participating.

I fully understand the risks and benefits of this research and realize that I will not receive monetary compensation for my participation. I know that my identity will not be revealed to anyone during the course of this study or in the final report, but I do realize that quotes from my interview may be used to enhance the research findings.

I understand that any questions that I have may be addressed to Ann Steele at (309)-556-2902, her project advisor Dr. Susan Swanlund at (309)-556-3282, or the chair of the Illinois Wesleyan Institutional Review Board Dr. David Bollivar at (309)-556-3677.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Respondent's Signature

\_\_\_\_\_  
Interviewer's Signature

**Demographic Data Questionnaire\***

Code Number: \_\_\_\_\_

Age: \_\_\_\_\_

Gender: \_\_\_\_\_

Marital Status: \_\_\_\_\_

Income Level:       under 25,000  
                          25,000-49,000  
                          50,000-74,000  
                          75,000-100,000  
                          over 100,000

Number of people in your household: \_\_\_\_\_

Your highest level of education: \_\_\_\_\_

Have you been hospitalized due to a cardiovascular condition in the past year? Y   N

How would you rate your health?

Excellent      Good      Fair      Poor

\*This Demographic Data Questionnaire was adapted with the permission of Dr. Susan Swanlund used for her Doctoral Dissertation.

1. How are you today?
2. Do you have a significant family history of heart disease or other illness?
3. How do you feel about your overall health?
4. Describe to me your current health state. What types of health problems, if any, do you have?
5. What medications are you currently taking? Would you mind if I looked at the bottles? (At this time, the researcher will make a list of medications.)
6. Did your medications change after each surgery? If so, which medications were added or subtracted after each surgery?
7. How much did you know about bypass surgery before you had it done? How well educated do you feel you are now?
8. When did you undergo the on-pump coronary artery bypass surgery? Where did you have it done? What were the circumstances surrounding the surgery (MI, CP, routine check-up)?
9. Please describe your on-pump experience for me. What type of information were you provided with prior to surgery? Was your preoperative teaching adequate?
10. When did you have the off-pump coronary artery bypass surgery? Was it before or after your on-pump experience? Where did you have it done? What were the circumstances surrounding the surgery?
11. Please describe your off-pump experience. What type of explanation of the procedure did you have? Did you feel that the explanation was adequate?
12. If you could, please compare the two surgical experiences.
  - From which surgery did you recover faster?
13. Were you able to regain your independence after each of the two surgeries? How long did regaining independence take in each case?
14. If you had to have another open-heart surgery, which type would you prefer to have?
15. What would you like to tell doctors or other health care professionals about the surgical experience? What should doctors tell the patients prior to surgery?
16. What advice would you give to a person who was about to have off-pump surgery performed? On-pump?



17. Is there anything else that you would like to say or did I neglect to ask anything that you feel is important or would benefit this research project?

18. Would you like additional resources sent to your home?