

## Annotated Source List

*CryoLife : Life Restoring Technologies*. CryoLife, 2014. Web. 30 Sept. 2014.  
<<http://www.cryolife.com/>>.

This source was a website concerning Cryolife Inc, a biomedical company specialized in the preservation of human heart valves, cardiac patches, saphenous vein, and femoral arteries and veins to be used for vascular rebuilding. One portion of the website talked about a decellularized graft known as SynerGraft that is created when scientists implant host cells in a collagen and fibrous matrix in order to harvest them. Because the cells were stripped from human tissue, the graft is more likely to be accepted by the body as its own. This website also explained the Hemodialysis Reliable Outflow Graft (HeRO) as an unconventional AV graft that has no venous anastomosis which allows for long term access in hemodialysis patients with central venous stenosis. A benefit to the HeRO Graft is that it leads to fewer infections, has superior dialysis adequacy, has high patency rates, and has a lower cost compared to catheter use. Patients who have previously undergone a Peripheral Bypass Procedure and may not have proper vessels to use as a bypass conduit can rely on CryoVein Saphenous Vein or CryoArtery Femoral Artery. The use of actual living tissue, and not synthetic materials, allows for greater resistance to infection as well as higher blood flow compliance.

This website was beneficial because it shared information about current research conducted by a company that specializes in re-creating vessel grafts to be used in bypass surgeries. This website shares visual aids such as charts, graphs, diagrams, and videos that show how CryoLife Inc. products have been made and how they are inserted and sutured during procedures. The source allowed for further research in other companies that specialize in vessel reconstruction and how their methods and technologies may differ and be more beneficial to patients. The source also assisted in understanding that bypass grafts have three origins: they can be extracted from the patient's own body and reused for a procedure, can be created from organic materials, or can be synthetically made from artificial materials.

*CryoVein Saphenous Vein for Peripheral Bypass - Animation*. Prod. CryoLife. *YouTube*. N.p., 23 Oct. 2013. Web. 24 Nov. 2014. <<https://www.youtube.com/watch?v=LkHByES9qL4>>.

This video highlighted one of the most prominent peripheral artery diseases, atherosclerosis, also known as plaque buildup in the arteries. PAD affects twelve to fourteen percent of the general population and as many as twenty-five percent of critical limb ischemia (CLI) patients are forced to get a major limb amputation within a year of progression. The alternative of amputation is caused by forty to fifty percent of patients lacking usable autologous tissue for bypass. Because CryoVeins are developed from cadaver vessels, it displays handling characteristics resembling that of autologous tissue along with suturability that seems natural. Because CryoVein is natural tissue, it allows for pulsability and increased patency and limb-salvage rates.

This video was beneficial because it explains the uses as well as development of CryoVein by the company that originally discovered the technology. The article shared facts and statistics about the usability of CryoVein as well as patency and limb-salvage rates that are crucial for bypass research. This source also provided visuals as to the placement of CryoVein

and how it works in opposition to diseases, such as atherosclerosis, to restore oxygen-rich blood flow throughout the body. This source also inspired further research to support the claims made within the video.

Culvert, Lee L., and Rosalyn Carson-DeWitt. "Peripheral Vascular Bypass Surgery." *The Gale Encyclopedia of Surgery and Medical Tests*. Ed. Kristin Key. 3rd ed. Vol. 3. Farmington Hills, MI: Gale, 2014. 1399-1405. *Gale Virtual Reference Library*. Web. 16 Sept. 2014. <[http://go.galegroup.com/ps/i.do?id=GALE%7CCX3199500418&v=2.1&u=howard\\_main&it=r&p=GURL&sw=w&asid=2e1b7bb9820dd9342036be012a7f519d](http://go.galegroup.com/ps/i.do?id=GALE%7CCX3199500418&v=2.1&u=howard_main&it=r&p=GURL&sw=w&asid=2e1b7bb9820dd9342036be012a7f519d)>.

This article focuses on Peripheral Vascular Bypass Surgery, a method of treating Peripheral Artery Disease, which is purposed to reroute blood circulation in veins. The document explains the main cause of Peripheral Artery Disease (PAD), atherosclerosis. Atherosclerosis is the tightening of arteries due to the buildup of plaque that causes the limited flow of oxygen-carrying blood and nutrients to limbs and body organs. This source discussed the varying forms of Peripheral Vascular Bypass Surgery which include, but are not limited to: Aortobifemoral Bypass Surgery, a procedure that redirects blood from the abdomen (abdominal aorta) to the upper thigh (femoral arteries); Femoropopliteal Bypass Surgery, a method of recirculating blood-flow from the thigh (femoral artery) to the back of the knee (popliteal arteries); and Femorotibial Bypass Surgery, which involves rerouting blood from the thigh (femoral artery) and tibia (tibial artery). The article details about the diagnostic tests that physicians may utilize in preparation of a surgery such as: Doppler Ultrasonography, which calculates the rate of blood flow; Angiography, a mode of obtaining X-ray images of afflicted arteries; and Spiral Computed Tomography, which uses magnetic resonance to map out the affected areas of the artery.

This article was extremely valuable because it contained and defined key vocabulary that is useful in understanding PAD and the process of how it is detected, treated, and prevented. This document also contains detailed illustrations along with step by step descriptions of performing a Femoropopliteal Bypass. This source provided a visual aide in understanding how the vessels are rerouted in to establish a better blood flow. By explaining how PAD is treated through bypass surgery, this article allows for readers to gain a broad understanding of the topic and assists in refining research into a narrowed topic.

Culvert, Lee L., Laura Jean Cataldo, and Tammy Allhoff. "Endovascular Stent Surgery." *The Gale Encyclopedia of Surgery and Medical Tests*. Ed. Kristin Key. 3rd ed. Vol. 2. Farmington Hills, MI: Gale, 2014. 574-578. *Gale Virtual Reference Library*. Web. 6 Oct. 2014.

Endovascular Stent Surgery is a minimally invasive surgery focused on treating blockages in the blood vessels of the body. When arteries become occluded by plaque buildup because of diseases such as atherosclerosis, surgeons place a mesh-wire tube (a stent) in the affected vessel. Endovascular stent is purposed to restore blood flow to body parts in a process known as coronary revascularization. Because this procedure takes place entirely inside the veins, surgery is normally done in larger arteries such as the coronary arteries, carotid arteries

and renal arteries. This article talks about how endovascular stenting is a popular treatment for emergency vascular event such as aortic aneurysms. Recipients of this procedure most often include those struggling with atherosclerosis and have increased risk of heart attack or stroke.

This article was beneficial because it gave extensive detail on exactly what Endovascular Stent Surgery is and used diagrams to illustrate what a stent actually looks like and how it is placed within an artery during a procedure. Terms associated with the procedure are defined so as to ensure the reader gets an accurate idea on the subject. The document gave details on the process doctors use to decide whether the patient qualifies for surgery, such as: exercise electrocardiogram, cardiac catheterization, CT scans or MRIs. The source caused further inquiry into major procedures that require stenting such as Aortic Aneurism Repair.

De Milto, Lori, and Angela M. Costello. "Coronary Artery Bypass Graft Surgery." *The Gale Encyclopedia of Surgery*. Ed. Anthony J. Senagore. Vol. 1. Detroit: Gale, 2004. 346-353. *Gale Virtual Reference Library*. Web. 19 Sept. 2014.  
<[http://go.galegroup.com/ps/i.do?id=GALE%7CCX3406200111&v=2.1&u=howard\\_main&it=r&p=GURL&sw=w&asid=1fde7bf6508ee5a81a0ad430f048f1de](http://go.galegroup.com/ps/i.do?id=GALE%7CCX3406200111&v=2.1&u=howard_main&it=r&p=GURL&sw=w&asid=1fde7bf6508ee5a81a0ad430f048f1de)>.

Coronary Artery Bypass Graft Surgery, an operation done in accordance with those who struggle with Coronary Artery Disease (CAD), is a procedure where blocked arteries are bypassed (rerouted) by a vessel graft. This surgery allows for blood flow to be reinvigorated to the heart. This article shares that the purpose for this procedure is to allay chest pain, angina, ischemia, and life expectancy. The American Heart association reports that in 2000, there were 371,000 male who underwent the surgery and 148,000 women received the surgery. This statistic suggests that CAD is more common in men than women. The document explains how in Coronary Artery Bypass Graft Surgery the function of heart and lungs is taken over by a cardiopulmonary bypass pump. The pump allows for surgeons to operate on a still heart while the machine removed carbon dioxide and replace it with oxygen as well as carry the oxygenated blood from the bypass machine to the aorta. If a patient is a candidate, this procedure can also be done as an off-pump surgery where advanced equipment is used to stabilize the heart. The incisions of the chest and for the graft are smaller which allows for faster recovery and a reduced risk of serious infection.

This article was beneficial for research because it elicited more topics for questioning as to why certain procedural events are carried out. The document shared that the most common grafts constructed for surgery are drawn from a piece of the internal mammary artery. This information brings out questions such as: "Why is the internal mammary artery used instead of the radial artery or saphenous vein (as used for Peripheral Artery Bypass)?" and "Which vein, vessel or artery provides the most blood flow and the best solution to the problem?" The reading also provided detailed and comprehensive visuals as exactly how the procedure is done and how the blood flow is rerouted. The article does not expound on how the graft is prepared for reinsertion after it is removed (which draws out more topics for research).

"Femoral Popliteal Bypass Surgery." *Johns Hopkins Medicine*. Johns Hopkins Medicine, 2014. Web. 21 Oct. 2014.  
<[www.hopkinsmedicine.org/healthlibrary/test\\_procedures/cardiovascular/femoral\\_popliteal\\_bypass\\_surgery\\_92%2CP08294](http://www.hopkinsmedicine.org/healthlibrary/test_procedures/cardiovascular/femoral_popliteal_bypass_surgery_92%2CP08294)>.

Femoral Popliteal Bypass Surgery is a surgery that uses arteries in major arteries in the leg, peripheral arteries, to restore oxygen-rich blood and other necessary products to the legs. This procedure treats problems caused by plaque blockages in the femoral artery that may be attributed to atherosclerosis, stenosis, and peripheral artery disease. Atherosclerosis in leg arteries usually suggests atherosclerosis in the brain and heart; causing problems such as limb complications, heart attacks, or strokes. Intermittent claudication, one of the more frequent symptoms of PAD, refers to limping because of pain in the lower extremities when walking which ceases when rested. This symptom can be referred to as "angina of the legs" as it signals low rates of blood flow. Critical limb ischemia, the most severe symptom of PAD, causes pain in the legs when resting and is the degradation of tissue when the limb's need for blood and nutrients is not met. Femoral popliteal bypass is performed in order to bypass the obstructed or occluded portion of the artery using another artery. The vessel graft is attached above and below the blockage and restoring blood-flow.

This article was beneficial in introducing new terms related to PAD and discussing symptoms that signal as red flags to doctors, indicating a need for femoral popliteal bypass surgery. The source answers frequently asked questions by using specific details about the procedure. The reason why surgeons used artery grafts instead of vessel stenting is made apparent. Pictures, as well as diagrams, are used so as to visually show how the procedure is done and the sites where the arteries are bypassed and attached. This source helped to form new inquiries as to why the popliteal artery is used to bypass the femoral instead of other arteries.

Gashti, Mojtaba, MD. Personal interview. 28 Jan. 2015.

This interview went extremely well, especially to the increase in confidence due to the fact that I learned a little bit more how to interview professionals since my first interview. I was also more comfortable with the interviewee being that he has been my mentor this year. Dr. Gashti was very open to answering my questions even though I have previously asked him similar questions casually. Dr. Gashti was able to answer my questions with very detailed answers and in a way that is easily understandable to all audiences. For my next interview, I would like to have more questions to ask besides my main questions. This would allow me to make sure the interview continues to be interesting and detailed. It was a little difficult to ask Dr. Gashti questions that we have sort of previously discussed, however, he was very nice about it.

Goldman, Steven, MD, Gulshan K. Sethi, MD, William Holman, MD, and Hoang Thai, MD.  
"Radial Artery Grafts vs Saphenous Vein Grafts in Coronary Artery Bypass Surgery."  
*The Journal of the American Medical Association* 305.2 (2011): 167-74. 12 Jan. 2011.  
Web. 22 Sept. 2014.  
<<http://jama.jamanetwork.com/article.aspx?articleid=892716>>.

This article addresses an experiment that tested whether or not arterial grafts, such as the mammary artery or radial artery, are better channels for Coronary Artery Bypass Grafting (CABG) than saphenous vein grafts. A one-year trial with 757 participants\* assessed the angiographic patency of using saphenous vein graphs versus radial artery grafts. The experiment was set up in a 1:1 ratio of patients receiving saphenous vein grafts or radial artery grafts, the vessel that would be bypassed, and if the surgery would be on or off pump. The article shared that although the differences in results were so minute, there were fewer surgical complications, regarding hemorrhages in patients treated with radial artery grafts than those treated with saphenous vein grafts.

This document was extremely beneficial in addressing one of the questions introduced in the previous source, "Why is the internal mammary artery used [for Coronary Artery Bypass Graft Surgery], instead of the radial artery or saphenous vein (as used for Peripheral Artery Bypass)?" Because, it was found in this trial that there was no noteworthy difference in one-year patency for the type of vessel graft (radial or saphenous), this experiment suggested that the internal mammary artery is grafted for CABG for the sake of institution and does not necessarily show that one conduit has functions better or has longer use. This article also paralleled its findings to other experiments that compared similar conduits and suggested reasons for differences in data. These possible reasons for inconsistencies allow for more possible research questions. This article also brings a reader to a question of whether or not synthetic grafts could be constructed as a way of creating more specialized grafts with higher patency rates.

Harvard Women's Health Watch. "Peripheral Artery Disease." *EBSCOhost*. N.p., Apr. 2012.

Web. 13 Sept. 2014.

<<http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=12&sid=66879bee-8aeb-4f20-8ff7-c79d47aa53a0%40sessionmgr110&hid=119>>.

This article addresses the fact that Peripheral Artery Disease (PAD) is an increasing problem in the aged population and highlights that this disease, previously thought to have a greater impact, and be more prominently found in men, is often undetected in women until the disease matures to a much greater problem. Atherosclerosis is introduced early in this article as a medical term meaning the "hardening of the arteries." Atherosclerotic plaque causes blockages in the arteries and limits the flow of oxygen rich blood to body parts such as the legs or the arms and causes Peripheral Artery Disease. The article discusses how the average woman had their symptoms of the disease introduced nearly ten years later than the average man although they still had the disease.

This document also focused the causes of PAD and its relation to cigarette smoking, diabetes, high blood pressure, high cholesterol, ethnicity, and heredity as factors for its appearance in certain people. This article discusses PAD symptoms and urges those who may be suspicious of whether or not they have PAD to seek medical expertise.

This article is useful because it goes into depth in its explanation of methods of how Peripheral Artery Disease can be detected. This includes the use of: Doppler Ultrasound, which uses a transducer to emit sound waves and creates the image of the vessels; Magnetic Resonance Angiograph, which uses an MRI scan to create the vessel images or a Computed Tomography Angiography, utilizes a CT scan to map out the arteries. This article will assist me in developing a topic relating to the ways P.A.D. can be detected.

Kakisis, John D., Christos D. Liapis, Christopher Breuer, and Bauer E. Sumpio. "Artificial Blood Vessel: The Holy Grail of Peripheral Vascular Surgery." *Journal of Vascular Surgery*. Elsevier Inc., 6 Dec. 2004. Web. 23 Sept. 2014.  
<[http%3A%2F%2Fwww.jvascsurg.org%2Farticle%2FS07415214%252804%252901696-9%2Ffulltext](http://www.jvascsurg.org/article/S07415214%252804%252901696-9%2Ffulltext)>.

This article addresses why artificial blood vessels may possibly be a better conduit for bypass surgeries. These vessel grafts are composed of viable tissue and have the ability to resist infection, to heal, to secrete products, and have a general lack of thrombogenicity, which means that it does not easily form clots. The document also related the elements that allow for artificial vascular grafts to be possible: a structural scaffold, vascular cells, and a nurturing environment. Scientists are tasked with creating artificial blood vessels that can be comprised of living tissue, can contract in response to stimuli, and can absorb and secrete products. Competition to generate artificial grafts with small diameters and high long-term patency rates dominates the vascular field. Scientist use scaffolds, most often composed of collagen and biodegradable polymers, as temporary growing skeletons that provide the needed shape for the maturation of the graft. Scientist trialed Polyglycolic acid as a scaffold in the construction of artificial vessels. PGA is incredibly porous which allows for proper diffusion of nutrients, but its meshes also leads to high bioabsorbtion.

This article was beneficial as it provided new information as to the kind of material of which synthetic grafts are made. It included information on the current problems associated with graft scaffolding and problems related to biodegradable scaffolds. The document conveyed that the vessel grafts were unable to withstand intraluminal pressure and therefore failed to have long-term or high patency rates. It was also realized that these synthetic grafts cannot be used for emergencies because of their lengthy preparation time, leading to increased risk of infection. New vocabulary terms were introduced and allowed for a further understanding of the true complexity of engineering vessels. It was explained that scientists use bovine cells in addition to human umbilical cords to create the artificial grafts which encouraged further study in the variety of cells and conduits that can be used in this sort of experimentation.

Korzets, Asher, Yaacov Ori, and Shlomo Baytner. "The Femoral Artery–Femoral Vein Polytetrafluoroethylene Graft: A 14-Year Retrospective Study." *Nephrol Dial Transplant* 13 (1998): 1215-220. Nephrology Dialysis Transplantation. Web. 1 Feb. 2015.  
<<http://ndt.oxfordjournals.org/content/13/5/1215.full.pdf>>.

Marin, Michael L. "Historical Evolution of Endovascular Grafts for the Treatment of Aortic Aneurisms." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 1-8. Print. Endovascular Intervention: Today and Tomorrow.

The intubation of major blood vessels as a process for improving the structure and function of arteries was a topic first addressed in 1912. It was not until more than 50 years later until 1964 when Dotter and Judkins introduced a paper detailing their findings of the need for intraluminal splints in propping vessels open. Dotter and Judkins promoted recanalization

following catheter-mediation. This article discusses the first major stent-graft designs created by Dr. Juan Parodi. These designs were the first to be widely used and accepted by the medical field because of their adaptability and success. The initial ideas of designs of stent-grafts continued to build in success and each model worked to optimize blood flow for each patient.

This source was beneficial because it introduced the first majorly contributing theories and scientists involved in the initial studies to build endovascular grafts. This chapter used illustrations and pictures of the design proposals and elaborated on the problems and successes associated with each of the stent-grafts. This source presented the reader with new terms and a greater background of the upstart of endovascular stent-graft testing.

Marin, Michael L. "Intravascular Stents." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 9-18. Print. *Endovascular Intervention: Today and Tomorrow*.

Until Dotter began major research of intravascular stent technology in 1969, major discoveries in the entire field of endovascular treatments lay dormant. Early researchers dealt with continuous failures due to poor designs with bulky configurations that caused poor expansion, stent migration, or thrombosis. This source details the initial methods scientists used to solve problems related to biocompatibility and thrombosis resistant stents. To reduce thrombogenicity, Dotter used positively charged metals, creating a smaller surface area, smooth surface, and a decreased likelihood of corrosion due to stress. This article discusses the investigation of self-expanding stent as a catheter-mediated process where inflation can be triggered by pump.

This source was beneficial because it introduces new vocabulary crucial to the basic understanding of intravascular stents and gave a detailed background as to how it has been developed through the years. The document also had photographs of the designs of the endovascular stents along with descriptions of each and how successful each was in its ability to prevent thrombosis and promote expansion.

Marin, Michael L., and Hollier, Larry H. "Anatomical Limitations of Aortic Endografting: Management of the Short Pararenal Neck." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 127-132. Print. *Endovascular Intervention: Today and Tomorrow*.

The procedures and devices used in the treatment of abdominal aortic aneurysms is constantly adapting and changing in the best ways to address the problem. The probability of successfully implanting stent-grafts is determined by the ability to choose the correct arterial location and properly fixate the grafts using attachment systems. In as many as 15% of cases, long-term attachment of an aortic endograft is not possible. A suitable diameter of an aneurysm neck for endo-luminal stent-graft repair can be found when elimination the most vulnerable aortic segment, the distal aortic neck, and replacing it with a bifurcated stent-graft. Current methods for creating a suitable endovascular stent-graft include the Mount Sinai stent-graft comprised of an uncovered Palmaz stent for proximal neck fixation combines with a polytetrafluoroethylene graft.

This article was beneficial in the development of my research based on the common problem of suitable neck length in stent-grafts to produce longest lasting results. This source

used photographs of past and current models of working stent-graft along with descriptions detailing the highlights of their effectiveness. This document also gives knowledge as to possibly future stent-graft and Palmaz balloon expandable stent designs. This article also includes new vocabulary so as to encourage my overall knowledge of the topic.

Marin, Michael L., and Hollier, Larry H. "Application of Endovascular Grafts to Diffuse Atherosclerotic Disease." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 43-52. Print. *Endovascular Intervention: Today and Tomorrow*.

High patency rates are common in aortobifemoral grafts used in the treatment of aortoiliac occlusive disease. Higher postoperative complications arise in elderly patients with a history of cardiopulmonary disease and those who are repeat patients. An alternative to this procedure is balloon angioplasty, with or without stenting, although a common result is recurrent restenosis. Balloon angioplasty has increased patency when occlusion or stenosis sites are local. Volodos, a Ukrainian surgeon, developed the treatment of aortoiliac occlusive disease in which he first used an angiographic guidewire to cross the stenosis or occlusion. Segment dilation of the vessel is used to prevent elastic recoil. The endovascular graft is then inserted on a stent in order to reline the dilated artery. This method established a basis for the development of current grafting techniques. In the treatment of arterial occlusive disease, a device comprised of a balloon expandable Palmaz stent and an expanded polytetrafluoroethylene (ePTFE) graft. This operation involves recanalization of the occluded arterial segment achieved by guidewires and directional catheters.

This source was beneficial because it highlighted the different methods and circumstances by which different types of grafts and grafting techniques would be used. This document also provided illustrations of the procedures in a step-by-step; labeled diagram. Pictures of effective stent-graft designs were also included. Statistics regarding patency rates and success with each method of operation explained were noted within this source along with possible solutions to post-operative complications.

Marin, Michael L., and Hollier, Larry H. "Description and Classification of Endoleaks." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 133-147. Print. *Endovascular Intervention: Today and Tomorrow*.

In the field of vascular surgery, the institution of endovascular grafts for degenerative aortic disease has become a greater alternative to traditional repair and has made it possible for previously "high risk" patients to receive standard care. The development of these grafts has encouraged surgeons to extend the application to healthier patients. Based on the patients' pattern of disease, commercially available and "hand-made" devices can be used. Device related complications include those regarding the occurrence of endoleaks. Endoleaks are residual blood flow between the aortic aneurysm sac and the aortic endograft. This is a cause for concern because the presence of an endoleak suggests incomplete aneurysm exclusion and a risk of continual aneurysmal expansion and rupture.



This source was beneficial because it introduced new terms concerning endoleakage that deepened understanding of the topic. The article also included photographs, CT scans, and diagrams to illustrate the type of endograft that may cause a leakage and effects of an endoleak. The document also expounded upon the classification of endoleaks and procedure to resolve the issue. The article was effective in its ability to assist the reader in recognizing the importance of addressing endoleaks during procedures and as an important factor in the decision of using various grafts in bypass surgery.

Marin, Michael L., and Hollier, Larry H. "Endovascular Grafting for Thoracic Aortic Aneurysms." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 95-107. Print. Endovascular Intervention: Today and Tomorrow.

The repair of thoracic aortic aneurysms is an involving procedure that requires entry into the thoracic and abdominal cavity. Because of the complexity of this procedure, TAA grafting includes serious complications such as death, paraplegia and renal failure. Despite the advancements of medical procedure and methods, the high complication rate is balanced against the risk of aneurysm rupture before the surgery is completed. TAA is significantly less common than AAA and amore grim prognosis is associated with TAA due to the high risks involved with surgical intervention. Grafts to be used in TAA usually need to be custom made for each individual patient due to varying length and diameter. Balloon-expandable Dacron or self-expanding grafts are commonly used due to higher success rates caused by their ability to be created and adjusted according to the patient's needs.

This source was beneficial because it has included images of the both the types of balloon-expandable and self-expanding grafts that are used in the treatment of TAA. The document also includes photographs of graft placement during a procedure along with detailed description of what is being done in each frame. The article breaks down a list of possible complications and case study results from various trials of methods for TAA repair. This source explained how different grafts can be ideal for different procedures and expands upon a concept mentioned in previous sources.

Marin, Michael L., and Hollier, Larry H. "Endovascular Grafts for the Treatment of Abdominal Aortic Aneurysms." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 73-94. Print. Endovascular Intervention: Today and Tomorrow.

Current studies show that the rate of occurrence of Abdominal Aortic Aneurysms is between 1.8% and 6.6%; therefore suggesting that incidences of AAA are increasing in industrialized countries. This burst in the morbidity rate has forced researchers to raise awareness for AAA and develop new methods for treatment. Because bypass surgery for AAA is more risky than other bypass procedures, this article details a list of criteria that must be fulfilled to allow for endovascular treatment. One of the most popular devices used to treat AAA is the Parodi device, a stent-graft comprised of a crimped, weft-knitted Dacron graft sutured to stainless steel Palmaz stent. The Dacron graft has thin shapeable walls that allow for expansion. The Parodi device is balloon-expandable, and balloon tipped catheters are used for their

deployment. The Sydney Endovascular Graft does not contain isolated stents for attachment of the grafts and instead uses “graft attachment devices (GADs)” into the length of the graft material. The metallic GADs are spaced according to the morphology of the aneurysm. The article goes on to explain the Chuter Device, the Volodos/Khrakov Institute Device etc.

This article was beneficial because it introduced different stent-graft devices and describes how each can be used in different situations of AAA. The source provided images of each of the devices as well as brief descriptions as to what the device is made of. Diagrams as to how the devices are placed during procedures are also included along with angiograms showing before and after surgery.

Marin, Michael L., and Hollier, Larry H. "Endovascular Repair of Peripheral Artery Aneurysms." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 53-72. Print. *Endovascular Intervention: Today and Tomorrow*.

Aneurysms can occur in any part of the arterial composition, but most commonly involve the aorta. The basic ideas in the use of stent-grafts in the treatment of aneurysms include reaching complete exclusion of the dilated sac. This prevents rupture, expansion, and embolization without disrupting flow through the native vessel. Using these devices provides an advantage over conventional surgery as it is placed from isolated access sites using minimally invasive techniques. Diminished perioperative morbidity, quicker recovery and shorter hospitalizations are therefore made possible. Stent-graft technology can be altered and specified to accommodate almost any anatomic situation in iliac circulation. Aneurysms confined to the common iliac artery have much of the graft from the gastric fork to the origin of the hypo gastric artery to allow minimal fixation and prevent disease progression.

This source was beneficial because it described methods for repairing peripheral artery aneurysms using statistics from cases and descriptive reasoning behind concepts. The document provided diagrams and illustration that show the placement of the stent-grafts in relation to the size and location of the aneurysm. The source also provided angiograms using fluoroscopy that shows the before and after images of an aneurysms treated with stent-grafts.

Marin, Michael L., and Hollier, Larry H. "Experimental Models Used in Endovascular Aneurysm Surgery." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 157-166. Print. *Endovascular Intervention: Today and Tomorrow*.

Because the traditional treatment of aortic aneurysms by open surgery has proved successful and relatively safe and durable in order for endografting to replace the former, it must prove to have a greater benefit. Doctors have been developing animal models to determine the efficacy of treatment in the prospect of human aneurysm progression. Dacron grafts patched are sewn onto the nitinol stent model to allow for optimal strength and structure. The endografts were also comprised of balloon-expandable Palmaz stents to be delivered by femoral arteriotomy. Once the graft was placed within the animal, the grafts remained patent for six months and became twisted and thrombosed in portions not covered by neointima. These investigations concluded that endovascular exclusion of an AAA was possible and that

oversizing the aortic diameter of the graft would help ensure a proper seal between the graft and the aorta.

This article was beneficial because it showed previous experiments that tested the institution of endovascular grafting to the treatment of aortic aneurysms. The source gave more information about Dacron stent-grafts and how they are used with nitinol to make better grafts. The document used new vocabulary and defined terms to broaden the reader's understanding of the topic. Fluoroscopic images, photographs and diagrams were used to illustrate the placement of the grafts as well as their composition.

Marin, Michael L., and Hollier, Larry H. "Intentional Internal Iliac Artery Occlusion to Facilitate Endovascular Repair of Aortoiliac Aneurysms." *Endovascular Grafting: Advanced Treatment for Vascular Disease*. Vol. 1. Armonk, NY: Futura Pub., 2000. 147-155. Print. Endovascular Intervention: Today and Tomorrow.

In modern vascular surgery, methods of performing the least invasive endovascular procedures are of the utmost importance. In intravascular abdominal aortic aneurysm repair, the three most used techniques include: aortoiliac stent-grafting, aortobi-iliac grafting, and aortouni-iliac/femoral repairing. The aortoaortic stent-graft is the most basic device to used, but durable implantation is only possible if there is enough typical aortic tissue distal to the aneurysm. The development of the bifurcated endograft was essential in allowing a greater amount of patients to become eligible for surgery because it does not require a distal neck. Aortofemoral stent-grafts are able to face these problems, but they mandate the manufacturing of an extra-anatomical femorofemoral bypass to adhere to the contralateral pelvis and limb. In order to remove arterial movement into the aneurysmal sac, an endovascular occlude must be placed at the origin of the contralateral common iliac artery.

This article was beneficial because it gives a deep description of major devices and methods used in endovascular repair of AAA. The source also gives multiple photographs and diagrams that illustrate the multiple stent-graft designs. Each illustration has descriptions that allow for a greater understanding of the topic. The document also shares historical information on the development of various methods and material designs of synthetic bypass grafts along with advantages and disadvantages of each.

Moore, Wesley S., and Samuel S. Ahn. "Aortoiliac Graft Limb Salvage Occlusion (Open and Closed): Thrombolysis, Angioplasty, Atherectomy, and Stent." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 387-92. Print.

Although there continue to be new techniques for the repair of endovascular aortoiliac disease and abdominal aortic aneurysms, most patients still receive aortofemoral bypass grafts. The foremost factor causing limb failure in aortoiliac and aortofemoral grafts is the progression of the disease atherosclerosis in both superficial and deep arteries and intimal hyperplasia. When proximal anastomosis is placed too far below the renal artery, atherosclerosis develops between the arteries and the graft itself. The type of graft used has not shown to be a factor in the incidence of limb graft failure. Low patency rates of grafts used in bypass can also be attributed to failure due caused by infection. In patients with occluded aortofemoral graft limb occlusion, the approach should be performed through the ipsilateral groin incision. Although extensive scar tissue may be accessed this way, this method allows for easiest access for graft placement and minimal blood/tissue loss.

This article was beneficial because it talked about the major problems associated with various grafting methods. The source shed light on the potential causes for graft failure and reasons why the failures occur. The document also shared the surgical method for performing the procedure with the most positive intended results. Statistics as well as patency rates are shared in this article so as to prove the tools and the methodical success. This document also contains diagrams visualize the procedure along with explanations that further expand knowledge of the subject matter.

Moore, Wesley S., and Samuel S. Ahn. "Aortoiliac Graft Limb Salvage Occlusion (Open and Closed): Thrombolysis, Angioplasty, Atherectomy, and Stent." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 393-94. Print

Early graft failures are most often attributed to a technical error such as an inaccurate suture line and/or intimal flaps. Grafts may become bended or twisted by kinking and entrapment. In reversed saphenous vein grafts, thrombosis is often caused by fibrosis of a valve or fibrotic changes in the vein graft. This failure may be caused by injury during the saphenectomy. In situ vein grafts, failures occur in the mobilized proximal and distal end of the vein graft. The stiffening in the middle of grafts may be caused by fibrosis from the valve cuff. Thrombosis in one to two years is most often due to progressive atherosclerosis in the arteries distal and/or proximal to the arterial anastomosis. Thrombosis post vein grafting normally ceases after two years except in the case of prosthetic grafts.

This article was beneficial because in order to discuss the patency and longevity of arterial grafts in my research, a more accurate understanding of how failures occur to decrease patency is needed. This source established a new concept as to the prevalence of thrombosis in reversed saphenous vein grafts. The document also helped to introduce new vocabulary so as to expand current knowledge about the subject. This source also shared data as to when the onset and offset of thrombosis occurs in graft and its relation to failure rates.

Moore, Wesley S., and Samuel S. Ahn. "Endovascular Femoropopliteal Bypass." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 322-39. Print

In procedures in more proximal vessels, the patency of endovascular intervention for occlusive disease of the femoropopliteal arterial segment is a lasting problem. This situation leads to the controversial invasive treatment of stable caudation. Many surgeons believe that the most appropriate endovascular femoropopliteal bypass would involve percutaneous balloon angioplasty of the diseased portion followed by the action of a percutaneous inserted graft to reline the superficial femoral artery. The self-anchoring graft would have to have enough hoop strength to withstand the recoil of the lesion or have an accurate intraluminal fluid pressure to keep the graft open. This technique is most beneficial because it allows a nearly entire percutaneous method and can be done as an outpatient procedure with local anesthesia.

This article was fantastic for its in-depth overview of various methods / procedures by which surgeons can complete an endovascular femoropopliteal bypass. This source was written in a way that actually taught the reader how to complete the procedure. It also elaborated on the reasons for each action taken and advantages / disadvantages of each method. This document also introduced new vocabulary as well as enforces old concepts. The reading also included images associated with the various types of grafts, stents, dynamic introducers, and catheters as well as descriptions of each. Angiogram images of the endovascular procedures are also included for the reader's benefit.

Moore, Wesley S., and Samuel S. Ahn. "Femoral-Popliteal-Tibial Graft Occlusion: Thrombolysis, Angioplasty, Atherectomy, and Stent." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 394-98. Print

Once an occluded bypass graft has been opened by the use of thrombolysis or surgical thrombectomy, a fixable contributory factor can be selected. Progression of disease in the iliac or the proximal femoral artery suggests that the inward blood flow can be treated by using percutaneous transluminal angioplasty (PTA). Disease in the outflow vessels can be corrected by angioplasty of the femoral and popliteal vessels. PTA is most effective in short segment lesions in relatively normal grafts. In most uses, PTA in most long irregular stenosis elicits rapid restenosis. Interventional methods for this include surgical revision with patch angioplasty or a jump graft. Angioplasty for vein graft stenosis has seen its clearest successes when lesions are single, coaxial, and shorter than three centimeters. Angioplasty for prosthetic grafts is reserved for proximal and distal anastomotic intimal hyperplasia. This stems from the fact that artificial infrainguinal bypass anastomosis is associated with an increased rate of intimal hyperplasia compared to that of a native artery.

This source was beneficial because it gave a very authentic description as to the uses and major roles of angioplasty as it pertains to graft occlusion. The article described the problems that lead to the use of angioplasty as well as possible solutions to the affect. The source supported its conclusions by referencing data from cases and studies it has encountered. This document also introduced new vocabulary and expounds upon a subject that was previously not known.

Moore, Wesley S., and Samuel S. Ahn. "In Situ Vein Preparation." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 568-73. Print 30

Successful in situ saphenous vein bypass caused surgeons to attempt more simple and less invasive operation while still completing the fundamental technical components of rendering the saphenous vein valves incompetent and occluding the venous side branches. Before the development of minimally invasive in situ vein preparation, surgeons made lengthy incisions over the course of the saphenous vein, creating problems with infection and possible necrosis. Preclinical studies showed that with angioscopic guidance, steerable nitinol catheters could be used to occlude venous side branches from within the femoral vein. Clinical trials were able to determine the following: the risk of coil misplacement into the vein lumen, the function of the system's ergonomics, the intimal damage from instrumentation and the long-term patency of in situ saphenous vein bypass grafts.

This article was valuable because it gave a broad overview of the overarching benefits of in situ vein preparation. The source describes clinical trials that helped mark advances in the harvesting method as well as gave actually data on past clinical trials. The document used extremely detailed diagrams to allow the reader to better understand what is occurring during in situ vein preparation and angiograms that show the process being done in real life.

Moore, Wesley S., and Samuel S. Ahn. "Saphenous Vein Harvesting." *Endovascular Surgery*. 3rd ed. Philadelphia: Saunders, 1989. 574-80. Print

In the last fifteen years the topic of minimally invasive surgery has inspired the creation of endoscopic treatments of surgical diseases such as laparoscopy. Many procedures such as gynecologic and gastrointestinal procedures utilize the natural occurring space within the peritoneal cavity. Surgeons expand this compartment with carbon dioxide insufflation which allows for a specific area to approach from a simpler angle. Endoscopic saphenous vein harvesting headlines as the next step in minimally invasive surgery; allowing dissection, side branch division, and saphenous vein removal to be performed in a surgically created space. The complications involved in saphenous vein harvesting are what puts it into a constant developmental stage. More devastating complications such as nonhealing wounds require debridement and skin grafting. The nonhealing site may sometimes require revascularization while the development of ischemic wound necrosis may occur and call for amputation. Another concern involved with endoscopic saphenous vein harvesting is the amount of time required.

This source was beneficial because it gave more information on how a vessel that can be used for bypass is harvested. The article also expanded on how the process of vessel harvesting is being improved upon by means of endoscopic harvesting. The document includes photographs of the incision site during endoscopic harvesting and sites of necrosis that detail the possible outcomes of the procedure.

Nelms, Justin, MD. Telephone interview. 4 Feb. 2015.

This interview was successful because I was able to confidently answer questions as well as receive detailed answers. Dr. Nelms answered my questions with enthusiasm and was very kind in doing so. Dr. Nelms also offered a lot of information that I have not previously heard about, so the interview acted as a very good learning experience for me. For my next interview I would like to continue to develop interesting follow-up questions so there can be a very intellectual conversation. It was easy to understand the information that Dr. Nelms presented to me. It continues to be a little bit difficult to talk to older people who I have never met before

NIH. "What Is a Stent?" *National Heart, Lung, and Blood Institute*. U.S. Department of Health and Human Services, 17 Dec. 2013. Web. 08 Oct. 2014.  
<<http://www.nhlbi.nih.gov/health/health-topics/topics/stents/>>.

A stent is a mesh tube that is used by surgeons to widen arteries found to have weak blood flow due to stenosis and those that are partially or completely occluded. Stents are composed either metal mesh or fabric mesh; the latter is used in larger arteries. Drug-eluting stents are stents covered in medicine that slowly secrete the drugs onto the surrounding artery in order to avoid further buildup of plaque. The actual placing of stents into arteries is called Percutaneous Coronary Intervention (PCI) and sometimes referred to as angioplasty. The article discusses how a stent is placed into an artery: a small incision is made in a blood vessel in the thigh, arm or neck; a stent is placed around a catheter; the catheter is guided through vessels to the area of blockage; the catheter is inflated, thereby opening up the artery, forcing plaque against the walls and reestablishing blood flow. A stent generates added support within the walls

of the artery and reduces blocked artery probability. An inner layer is created over top of the stent by vessel cells and the artery returns to a normal appearance.

This article is beneficial because it introduced drug-eluting stents, which allows for further research onto the type drugs that are released by the stent. This source provides an animation that showed the process of angioplasty which provided increased understanding of the topic. The article also used new terminology with definitions in order for information to be better synthesized by the reader. The video also stated important health facts and treatments that may lead a patient to an increased health status.

Nimako, Hilda, RN. Telephone interview, 1 May 2015

This interview went very well and offered a new perspective onto my research. This far, all of my interviews have been from vascular surgeons. This interview was in the eyes of a RN which offered a point of view from a person who has to care for patients following a procedure. Although Mrs. Nimako did not directly work with bypass patients very often, she was able to share very insightful responses with me. For the next interview I would like to have a nurse or another hospital worker who works more directly with vascular patients. It was difficult to ask questions about a topic so specific and not directly connected to the field of study to which I am researching.

Perler, Bruce A., MD. Online interview. 3 Dec. 2014.

I think that this interview went pretty well being that it was the first formal interview I have ever conducted. Dr. Perler answered all of my questions but it seemed as though he was a little bit short on time because the responses were pretty brief. For my next interview, I want to make sure that the interviewee has enough time so that the product doesn't seem rushed. I would also like to have more questions or follow up inquiries in connection with the answers the interview. The interview was easy in the sense that I was genuinely interested in the responses that Dr. Perler offered. The interview was difficult because it is always a little weird to have discussions with people you have never talked to before. It was also difficult to develop questions that were interesting enough for a discussion to occur.

Proseus, Elaine R., and William A. Atkins. "Angioplasty." *The Gale Encyclopedia of Nursing and Allied Health*. Ed. Brigham Narins. 3rd ed. Vol. 1. Detroit: Gale, 2013. 212-215. *Gale Virtual Reference Library*. Web. 16 Sept. 2014.  
<[http://go.galegroup.com/ps/i.do?id=GALE%7CCX2760400066&v=2.1&u=howard\\_main&it=r&p=GVRL&sw=w&asid=e82549ada4fe13309c98b474a152aee5](http://go.galegroup.com/ps/i.do?id=GALE%7CCX2760400066&v=2.1&u=howard_main&it=r&p=GVRL&sw=w&asid=e82549ada4fe13309c98b474a152aee5)>.

This article discusses Angioplasty, a procedure carried out in order to expand blood vessels perturbed by atherosclerosis, stenosis or occlusions. Angioplasty, as explained by this source, restores the circulation of blood to organs and distal regions of the body. In order to broaden the vessels, catheters (flexible, hollow tubes) are placed, following a guard wire, into a portion of an affected artery. The catheter is inflated in order to widen the vessel and force plaque (a buildup of cholesterol, fats, and calcium) against the walls of the artery. In the interest of providing support and maintaining the expansion of the vessel, a stent (comprised of mesh wire) may be placed in the artery. The document also introduces a key term, fluoroscopy, which



provides an understanding of how physicians are able to navigate through vessels by using light contrast media to create an angiogram. This source explains that a diagnostic test, angiography, is performed before an angioplasty. An angiography (aka coronary catheterization) is carried out when a catheter is put into blood vessels circulating to the heart and contrast dye is entered into heart arteries. Physicians use an X-ray scan to show where hardened arteries are so they can more accurately solve the problem.

This article is helpful because it gives a brief description as to what Angioplasty is and how it is performed. This source, however, does not contain medical terms that can be further researched and seems to be extremely rudimentary in its description of angioplasty. This article provides a basic understanding of an angioplasty and prompts a person to perform supplementary research in order to have a better idea of the usefulness of angioplasty. The document does encourage additional study in its mentioning of the usefulness of grafts in Vascular Bypass Surgery and how it can be used to reroute blood supply.

Simlote, Kapil, MD. Telephone interview. 2 Feb. 2015.

This interview went very well because once again, the doctor was more than open in his responses to my question. Dr. Simlote gave very honest and detailed answers to my questions I continued to develop my confidence with interviewing so it was very smooth and easy. For a next interview I would like to have even more follow-up questions so that the interview can be even more intellectual. The interview was easy because of Dr. Simlote's willingness to answer my question. It was difficult to maintain a conversational type of interview with someone that I don't know that well.

Spiwak, Allison Joan, Tish Davidson, and Rosalyn Carson-DeWitt. "Aortic Aneurysm Repair." *The Gale Encyclopedia of Surgery and Medical Tests*. Ed. Kristin Key. 3rd ed. Vol. 1. Farmington Hills, MI: Gale, 2014. 120-124. *Gale Virtual Reference Library*. Web. 6 Oct. 2014.

Aortic Aneurysms are caused when a portion of the aorta wall becomes weak. This weakened wall allows blood to create a ballooned area where pressure increases and forces to the aorta to break and cause internal bleeding. Because the aorta is the largest blood vessel in the body and carries blood directly from the heart to every part of the body, a rupture of this vessel is most often fatal. Aortic Aneurysm Repair is the most common procedure done after the vessel has dilated greater than six centimeters. The article also talks about the demographics of patients who receive this treatment. Most recipients are around 65 years of age, have a history of medionecrosis or atherosclerosis, or have congenital defects. The two main techniques for this repair include an endovascular procedure or an open incision. The endovascular procedure is minimally invasive and involves a small groin incision to take a stent through the blood vessels towards the aorta. Open incision involves an incision through the length of the sternum along the abdominal wall. The aneurysm is opened and tissue is sutured to a synthetic fiber graft.

This article was valuable because it shed light on one of the many procedures involved in stent or graft placement in affected vessels. The source gave a detailed illustration of how an Aortic Aneurysm Repair would be done in an open incision scenario. Along with the diagram, the document gave a description of different ways a surgeon may attempt to treat a patient if a

situation may arise. The article also induced questions such as, “Why surgeons use stents for endovascular procedures and grafts for open incisions?”

Stoeckel, Dieter, Alan Pelton, and Tom Duerig. "Self-Expanding Nitinol Stents: Material and Design Considerations." *European Radiology* 14.2 (2004): 292-301. NDC, 2003. Web. 13 Oct. 2014. <[http://www.nitinol.com/wp-content/uploads/2010/05/2003\\_Stoeckel\\_Self\\_Expanding\\_Nitinol\\_Stents.pdf](http://www.nitinol.com/wp-content/uploads/2010/05/2003_Stoeckel_Self_Expanding_Nitinol_Stents.pdf)>.

Researchers are having success in the area of self-expanding stents based on Nitinol material. Nitinol (nickel-titanium) alloys have properties that allow them to have shape-memory and super-elasticity. After stress is put on Nitinol and deformation is enabled, the material reacts to the force because of a change in its crystal structure. When the stress is removed the nitinol will return to its original shape. This super-elasticity is best seen when there is at a normal body temperature. Nitinol stents are made larger than the target vessel, so that once inserted via catheter into the vessel, they can fully expand and give the vessel a strengthened composure. There are concerns, however, with the high concentration of nickel in these stents. Nickel is known to have a dissolving and corrosion power that may cause hostile affects.

This document is beneficial because it described one of the major materials by which endovascular stents are made. The source describes how self-expanding nitinol stents are created to be used in areas where vessels have become occluded. This article shared the wire-based designs that the nitinol stents are arranged in and the pros versus cons of each including: the intracoil stent, cragg stent and the welded symphony stent. The source also introduces new vocabulary along with definitions and examples in order to give the reader a better understanding about the stents. The document also contains a vast amount of tables, diagrams and images relating to the stent that allow the reader to get a better mental image of the self- expanding stents.

The Society for Vascular Surgery. "Peripheral Artery Disease (PAD)." *Vascular Web*. The Society for Vascular Surgery, 26 Jan. 2010. Web. 13 Sept. 2014. <<http://www.vascularweb.org/vascularhealth/pages/peripheral-artery-disease-%28-pad-%29-.aspx>>.

This article gave background information about the nature of Peripheral Artery Disease. It addresses what Peripheral Artery Disease is and defines it as a disease where the arteries in a body become occluded and do not allow for the flow of oxygen-rich blood throughout the body. This source illustrates the effects of untreated Peripheral Artery Disease and the problems associated with the displeasures that the disease causes. The document describes how as one ages, plaque buildup causes arteries to shrink and become rigid, eventually decreasing blood-flow to different parts of the body. It is further discussed why some may have a greater risk for developing Peripheral Artery Disease.

The article shares how Peripheral Artery Disease can be treated by various methods such as decreasing consumption of cholesterol and fat and increasing physical activity. Medications and various surgical procedures are also alternatives. The article details about surgical methods such as Angioplasty and Stenting which is when a catheter is interpolated into an artery. The catheter is pumped and inflated which pushes plaque buildup against the sides of an artery, causing the vessels to broaden and allow blood flow. A Stent may then be placed in the artery to

promote the widening of the arteries and discourage future blockage. This article also explains other surgical treatments including: bypass surgery, which uses a graft to create a new passageway for blood to flow; Endarterectomy, when surgeons physically remove plaque from an artery; and amputation in extreme cases.

This gave an outline describing what Peripheral Artery disease actually involves, what it is caused by, and how the disease can be treated. This document also gave a brief description of surgical methods used to treat the disease, introduced new medical terms and concepts and gave ideas for future exploration of the topic.