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Trends in Cardiovascular Engineering and Its Advances

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Abstract

The aim of this study is to represent "trends in cardiovascular engineering and its advances". Cardiovascular diseases create a negative impact on medical science. Different types of modern machines and technologies are used to reduce those diseases. Stroke, heart attacks, heart failure, heart valve complications and arrhythmia are main cardiovascular diseases. Blood vessels and heart molecules need proper supply of oxygen to maintain a healthy lifestyle. Every person should maintain a healthy diet and exercise on a daily basis to mitigate those issues significantly. Various kinds of therapies and technologies are used by a technologist to manage cardiovascular engineering in an organised manner. Every technologist must have ideas and thoughts related to usage of those technologies. For this reason, these individuals can provide better suggestions to their patients. Cardiovascular engineering helps to maintain a wide range of engineering projects and biomedical in an organised way. Up to date and modern technologies are implemented in cardiovascular engineering and its trends. Biomaterials and regenerative technologies are used to provide better services and treatments to the patients. Experienced technologists can easily provide better treatments in any emergency cases. Tissue engineering and delivery of bimolecular includes in this particular engineering process.

Index Terms

Cardiovascular, stroke, heart attack, biomaterials

INTRODUCTION

Cardiovascular engineering refers to a framework by which everyone can easily understand types of cardiovascular diseases. A multidisciplinary effort helps a person to improve those cardiovascular diseases significantly [1]. For this reason, a person always tries to maintain a healthy lifestyle on a daily basis. Human beings suffer from several types of cardiovascular diseases such as: stroke, aortic disease, coronary heart disease and peripheral arterial disease. The heart and blood vessels are affected by these cardiovascular diseases. Smoking, high blood pressure, unhealthy diet, lack of exercise and high cholesterol creates a negative impact on human health on a daily basis. For this reason, every person suffers from cardiovascular diseases. Coronary artery disease is known as the most common cardiovascular disease. Chest pain, heart attacks and strokes are caused by this cardiovascular disease. Heart rhythm problems, congestive heart failure, congenital heart diseases and endocarditic are also known as cardiovascular diseases [2]. Cardiovascular technology plays an essential role to reduce heart related diseases significantly.

In medical science cardiovascular technology plays an essential role, by which everyone can learn treatments and diagnosis of heart. Peripheral vascular conditions (blood vessels) are managed by this cardiovascular technology [3]. Cardiovascular technologists must require skills to assist physicians in an organised manner in invasive processes such as: catheterisation. These individuals can provide better treatment to their patients who suffer from heart and blood vessels related diseases. Heart health is managed on a daily basis with help of these cardiovascular technologists. In recent days, many individuals suffer from these particular diseases due to pollution. Modern equipment is used by cardiovascular technologists on a daily basis, for this reason, these individuals have better ideas about usage of cardiovascular equipment. Cardiovascular technologists must identify heart related problems of their clients [4]. Sometimes patients are not suffering from heart related diseases; hence these individuals are not monitored and cared properly. Consequently, cardiovascular technologists have a responsibility to identify proper disease and provide proper treatments to their patients.

MATERIALS AND METHODS

Proper framework is controlled by a researcher to finish their research work within a given deadline. In this study, researcher uses an "inductive" research approach. This particular research approach helps to mention convulsions from specific to general. Researcher can easily develop a theory related to a subject matter by this "inductive" approach. Specific observation, general conclusion and pattern recognition are managed by these individuals in an organised manner [5]. Researcher can maintain a systematic procedure of work with help of this "inductive" research approach. A coherent and logical way of a research work is controlled by a researcher. Specific evaluation objectives of work are managed by this particular process and strategy of research work. This approach allows flexibility of research work and generation of new theory is supported by researcher [6]. Researcher has a responsibility to define their subject matter in a simple manner, by which everyone can easily

understand inner meaning of a study.

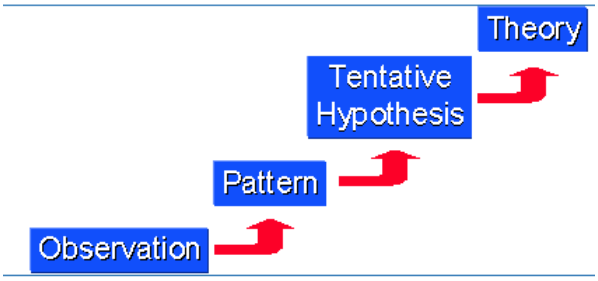

Figure 1: Inductive research approach

Research design helps researcher to gather information and knowledge related to a subject matter. Every research work has aims and objectives and researcher has a responsibility to achieve those aims in a significant way. These individuals use "qualitative" research design for this particular study. A unique way of research process is maintained by a researcher with help of this "qualitative" research design [7]. Researcher can easily solve any complex subject matter by this research design. These individuals provide better answers to research questions significantly. In depth interviews, observations and focus group discussion are three important functions of qualitative research design. This qualitative research design helps research participants to access thoughts and feelings of researcher [8]. Different knowledge and information related to a subject matter is gained by qualitative research design. Researcher follows a secondary research type for this study to gather existing data. Online journals, websites and channels are used by these individuals to collect relevant data related to a subject matter.

Figure 2: Qualitative research design

Researcher has a responsibility to maintain authenticity, reliability and validity of a work. Time and budget related issues are faced by a researcher to finish their work within a given deadline. Hence secondary research type helps researcher to collect relevant and authentic data of a study [9]. These individuals can attempt to answer a new research questions. Alternative research process is also followed by a researcher by this secondary research type. Researcher includes inductive research approach and qualitative research design. Secondary research type is maintained by these individuals for this study. Primary research type, deductive research approach and quantitative research design are excluded for this study.

RESULTS

A brief idea about cardiovascular engineering

A wide range of biomedical and engineering projects are encompassed with help of this cardiovascular engineering. Mechanisms, treatments and detection of cardiovascular health and diseases are targeted by this particular technology [10]. Diseases of heart and heart valves, vasculature and lymphatic's are integrated by engineering science of solid mechanics and fluid dynamics. Paediatric cardiovascular diseases are maintained with help of this cardiovascular technology. These technologies are immensely beneficial for patients who suffer from heart attacks and strokes. Up to date technologies are used by a cardiovascular regeneration to provide better treatment. Gene, drug and cellular therapies are effectively advantageous for maintaining cardiovascular technology [11]. Biomaterials, bio 3D printing and nana technologies are used to provide better services to their patients. Cardiovascular technology uses computational and experimental approaches for asking questions spanning genes and small molecules. Cellular and organ levels are mainly used by this cardiovascular technology for small molecules and genes [12]. Most of the cases are multi-scale and integrative for this particular type of technology. Biomaterials play an essential role to provide proper treatment related to cardiovascular diseases.

Fluid dynamics and mechanics of blood is studied within a heart, heart valves, lymphatic vessels, blood and vascular grafts. This mechanism plays an essential role to maintain multi scale "OMICS" and in silicon approaches. Cardiovascular technology helps to provide prominent and better services to their patients to reduce heart related diseases significantly. Mechanical heart valves, new bio prosthetic designs and polymeric trileaflet valve prostheses recognised with help of this particular technology [13]. This research work mainly includes arterial remodelling, endothelial cell biology and arterial hemodynamic. This creates a positive impact on medical science to reduce heart related issues from human beings. Stroke, fluid dynamics of thrombosis, sickle cell disease and aneurysms are included in this particular technology. Mechanical properties and stresses in healthy and diseased arterial cross sections are addressed with help of cardiovascular solid machines work [14]. This particular solid mechanics work helps to provide better triteness and services to their patients.

A multi-disciplinary effort helps cardiovascular engineers to improve understanding of cardiovascular diseases and also identify proper strategy of treatment. Better therapies are provided by cardiovascular technology to enhance their efforts. This creates a positive impact to develop new methods of study. A better diagnostic system must be

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provided by an engineer for maintaining better health conditions of many individuals [15]. In case a doctor provides better diagnosis of cardiovascular diseases, patients are attracted by this particular therapy. Blood flow to body, brain and heart is reduced as blood clot within a human being. Thrombosis disease is also known as blood clot disease for a person. Cardiovascular technologists must have knowledge in medical equipment and tools. For this reason, these individuals can easily use those technologies and machines in a significant way.

Work process and strategy of those technologists are immensely beneficial for cardiovascular technology. These technologists provide advanced and basic life support skills to their patients. In case an emergency issue arises, these individuals provide better treatment to their patients. In order to save people's lives emergency invasive procedures are maintained by these cardiovascular technologists. Biomaterials and regenerative technologies include both translational and basic research including materials science, tissue engineering, and bimolecular delivery [16]. This bimolecular delivery mainly includes both cellular and molecular biology.

Trends in Cardiovascular engineering

Interaction of cell types, mechanical cues and matrix molecules are known to everyone with help of this regulation of heart growth. Essential segment is to reach the proper size, shape and function of heart. Tissue engineering approaches are used by mechanical loads and vascular cell co culture [17]. Human myocardium in vitro has been organised by this particular trend of cardiovascular engineering. Engineer tissues are constructed by this hypertrophy, proliferation and cardiomyocyte alignment.

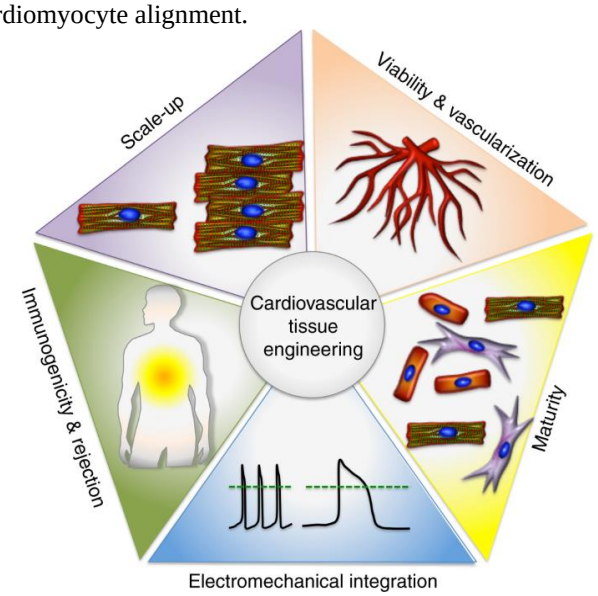

Figure 3: Cardiovascular tissue engineering

Cardiovascular technologists can measure contractile function and force length dependence of engineering tissue by this particular process. Vitro model of human cardiac development is characterised by aims of this particular study. Organised, vascularised and contractile human cardiac tissues are used to work towards human therapeutics [18]. Every cardiovascular engineer can easily enhance their knowledge and information related to the biomedical sector. Essential goal for field of cardiac biology creates a positive impact on generating engineered cardiovascular tissue. Normal human myocardial development is known to everyone by this field of cardiac biology. Human models of cardiomyopathies play an essential role in this particular field. Other cardiovascular diseases are managed by this particular process of cardiovascular field.

Many individuals suffer from cardiovascular diseases, consequently creation of cells among those individuals are hampered due to this particular disease. Cardiac biology helps to create cell and tissue based therapies for patients with this cardiovascular disease [19]. A successful cardiac catheterization laboratory includes inputs from managers, planners and staff. Patient safety and efficiency must be maintained in this laboratory to enhance quality patient care. Several types of key components are available such as: lab equipment, lab storage, lab design and staff. Staffs are an essential segment for a lab to enhance their performance and provide better treatment to their patients. This particular lab requires specially trained healthcare professionals for providing better treatment. Cath lab process is supported with help of Cardiovascular and radiology technologists. Several types of registered nurses are required for a lab to support interventional cardiologists.

Cardiovascular field deals with understanding behaviour of cells and tissues in health and diseases using qualitative engineering tools. In case a technologist can understand proper process and strategy of work, this individual provides better treatments and services to their patients. Every technologist has a responsibility to develop new strategies for engineering and replacing human cells and tissues [20]. In recent days, medical science increases their work field significantly to maintain their normal function of work. Power of materials to stimulate, modulate and control repair mechanisms of the body is managed by this cardiovascular engineering. Irreparable tissues and organs are managed and healed with help of this cardiovascular technology. Natural tissues are maintained by this rational design of biomaterials. Smart biomaterials play an essential role for using organic and inorganic synthesis [21]. These smart biomaterials are designed by this particular technology for providing better services and treatments to their patients.

Temporal control of bio molecules is provided with help of this cardiovascular technology. Scaffolds for regenerative medicine, stem cell engineering, and 3D bio printing are included in cardiac technology for providing better treatment. 3D bio printing technology helps to construct multi cellular and multi materials tissues. Cath lab design must be maintained by cardiac technologists significantly to enhance their skills and knowledge for providing better services to their patients [22]. A cardiac technologist has a responsibility to select proper location for Cath lab. Designers should

consider where the sickest patient gets necessary treatments. Cardiac units and operating rooms are close to each other in this particular Cath lab design. Several types of modern Cath lab equipment are implemented by technologists to provide better treatment. X ray machines, a patients table, monitors and procedure cars are essential instruments within a Cath lab. Cath lab Technology Company always tries to provide innovative and relevant products and services to their customers [23]. For this reason, patients are attracted by this particular Cath lab. Machine learning process and 3D imaging process are maintained with help of this cardiovascular technology.

Advances of cardiovascular engineering

Cardiovascular diseases can cause human death as an escalated strain is put on the heart by this disease; as a result, people can face extreme levels of chest pain. This pain is often created just because of the restriction of normal flow of blood to blood muscles. In recent days, the rate of people who suffer from several cardiovascular diseases has decreased due to the development of cardiovascular engineering. Several diseases related to cardiac tissue are treated and diagnosed by this kind of engineering [24]. Cardiovascular engineering has a great importance in identifying the procedure through which heartbeat is controlled by molecules. Despite this, this engineering plays an indispensable role in generating models related to mathematics in the field of creating a connection between the nanoscale molecular foundation of the function of the heart and the heart-function itself.

Functional tissues are constructed with the help of this cardiac tissue engineering. This cardiac tissue engineering helps to maintain structure and function of injured myocardium. High fidelity models for studies of cardiac development and disease can be served by the advances of cardiovascular technology [25]. Tissue engineering is maintained with the help of three dimensional environments. Cell functional and differentiation can be mediated by this tissue engineering. Some key requirements are required for proving better treatments and services to their patients such as: selecting human cell source, establishments of cardiac tissue matrix and electromechanical cell coupling. Therapies play an essential role to prevent and reverse heart failure in a significant way. Daily lifestyle of a person is enhanced with the help of this tissue engineering. Failure of organs is managed by a technologist due to these functional biological grafts [26]. Normal tissue structure is known to everyone; hence this tissue engineering helps a technologist to understand proper function and sizes of all tissues within a human body.

Three key factors of native myocardium are high density of supporting cells and myocytes, efficient exchange of oxygen between cells and blood and electrical signal propagation. This process is effectively beneficial for tissue engineering to provide better services to their patients. A major challenge for field of cardiac tissue engineering is to re-establish unparalleled complexity of injured heart tissue [27]. Cardiovascular activities can be monitored by the implication of advancement of cardiovascular engineering. Betterment of therapies and detecting of the disease can be improved with the application of cardiovascular engineering in the recent medical era. Experienced and skilled technological efficiency has enhanced the probability of procurement of cardiac disease. Implication of cardiovascular engineering in health organisations also determine the precautions associated with certain unpleasant events of heart failure [28]. Regulatory enactment of cardiac rhythms also has been monitored and diagnosed by the implication of cardiovascular engineering on a daily basis.

Doctors and patients both are benefited with the applications of cardiovascular engineering systems to avoid unnecessary stress regarding cardiac hazards and pharmaceutical interpretation has been developed considering the medical consequences. Vascular implantation to generate thrombi in the heart also has been controlled by the advanced technological effort of cardiovascular engineering [29]. Cardiac surgery became more significant and the success rate of the surgery has been phenomenally increased with the implication of cardiovascular engineering. Considering all consequences it has been highlighted that cardiovascular engineering has a significant role in the medical status of cardiac disease.

Heart attack, stroke, heart valve complications, arrhythmia and heart failure are major diseases for this cardiovascular technology. Myocardial infarction (heart attack) is one of most major cardiovascular diseases. Different types of heart molecules are available in the human body. Those molecules need a proper supply of oxygen for 24 hours significantly. In case this supply of oxygen is hampered, heart molecules cannot be able to operate properly. For this reason, a heart attack occurs in every 40 seconds. Blood flow delivers proper oxygen to heart, in case process of blood flow is reduced or stopped, heart attack occurs at that time. This heart attack mainly occurs due to atherosclerosis which includes slow build-up process of plaque. This plaque refers to cholesterol, fat and other substances. Way of blood flow is hampered due to this plaque and all blood clots form around a plaque.

Stroke is also referred to as a heart disease as this condition occurs related to blood flow. Hence, stroke occurs due to problems with blood flow in the brain. People have many blood vessels in their body; these vessels provide a proper supply of blood and oxygen to brain. In case these vessels may not be able to supply necessary oxygen and blood to brain, stroke occurs at that time. Parts of brain cannot be able to work properly without blood and oxygen. Blockages are also responsible for haemorrhagic strokes such as: abnormal growth of brain blood vessels and vascular malformation. In recent days, medical science is effectively advantageous for every human being to maintain a healthy lifestyle. Biologically based restoration is enabled with help of this cardiovascular tissue engineering.

DISCUSSION

Cardiovascular engineering helps to provide better treatment to patients. Modern technologies are effectively beneficial for maintaining mechanisms, treatments and detection of cardiovascular health and diseases. Solid mechanics and fluid dynamics of engineering science helps to integrate diseases of vasculature, lymphatic's, and heart and heart valves. Different types of therapies are implemented with help of this cardiovascular technology. Cellular therapies, drug and gene help to manage this particular technology in an organised manner. Computational and experimental approaches are used by technologists for maintaining this technology. Different types of experiments help to provide better suggestions and treatment to their patients. Biomaterials create a positive impact on medical science due to this modern technology and machines. New bio prosthetic designs and mechanical heart valves are processed by this cardiovascular technology. Modern designs and medical supports are immensely advantageous for reducing different types of diseases related to heart valves and molecules. Arterial remodelling and arterial hemodynamic are included within trends and advances of cardiovascular engineering.

Different types of treatments are available for this cardiovascular disease. Cardiovascular engineers have a responsibility to identify proper disease and provide necessary treatments. This particular solid mechanics work helps to control stresses and properties in diseased arterial cross section. Every engineer has a responsibility to provide a better diagnostic framework to patients. Emergence conditions of a patient are controlled properly by this modern technology and engineering. Heart growth of a patient creates a negative impact on health conditions. Sometimes, heart attack and stroke occurs due to this growth of heart. This growth is known to technologists with help of this particular technology and engineering. Contractile function and force length dependence of engineering tissue are measured by this technology. Mission of this study is to identify vitro models of human cardiac development. Human therapeutics use organised, contractile and vascularised human cardiac tissues for providing better services to patients. Cardiovascular technology helps to gather information and knowledge of biomedical engineering significantly.

Cardiovascular diseases create a negative impact on the creation of cells and molecules. For this reason, a person may not be able to maintain a healthy lifestyle on a daily basis. A healthy diet and proper exercise helps an individual to recover from cardiovascular diseases. A successful catheterization laboratory helps to provide a better diagnostic framework. Different types of key components help to enhance performance of this lab. Lab equipment, lab storage, lab designs create a positive impact for providing better treatments. Trained healthcare professionals are needed for this particular lab to understand proper usage of each and every machine. Experienced healthcare professionals can easily identify accurate diseases of the patients. For this reason, proper and relevant diagnosis is maintained for this particular patient. This individual can easily recover from cardiovascular diseases. Heart attacks and strokes are major cardiovascular diseases for a person. Heart molecules may not be able to get a proper supply of oxygen and blood flow. For this reason, these molecules cannot be able to work properly.

Heart molecules are major parts of a heart, in case these molecules cannot be able to work in an organised way, heart blockages occur within a person. In case a person takes healthy and proper food every day, blood and oxygen flow to the heart is maintained properly. Brain vessels are affected by stroke of a person. Heartbeat of a person is also measured with help of this cardiovascular technology. Several types of functional tissues are constructed by this cardiac tissue engineering. Goal of this tissue engineering is to maintain functions of all tissues and vessels. This engineering helps to improve damaged tissues, blood vessels and blood molecules in an organised manner. Engineers can easily understand proper usage and treatment of cardiovascular diseases with help of this tissue engineering.

CONCLUSION

Cardiovascular technology helps to improve multidisciplinary effort to recover from these diseases. Cardiovascular diseases are strokes, heart attacks, heart failure, aortic disease and coronary heart disease. These diseases create a negative impact on health and mental conditions of a person. In recent days, medical science plays an essential role for maintaining cardiovascular technology and diseases in a simple manner. Most common cardiovascular disease is coronary artery disease. Chest pain, strokes and heart attacks are caused with help of these diseases. Every person has a responsibility to maintain a healthy lifestyle on a daily basis. For this reason, these individuals follow a healthy diet chart and exercise every day.

Cardiovascular engineering refers to a wide range of engineering projects and biomedical. Several types of mechanisms and treatments are mentioned in this study, by which engineers can easily understand treatments of these diseases. Biomaterials and modern machines are used to mitigate those issues related to cardiovascular engineering. Material science and tissue engineering plays an essential role for biomaterials and regenerative technologies. Formation and growth of cells are maintained with help of this cardiovascular engineering significantly. Cath lab is also an essential segment of this engineering to provide better treatments and services to patients. Therapies are also essential for cardiovascular diseases to mitigate spreading in the entire body."

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