

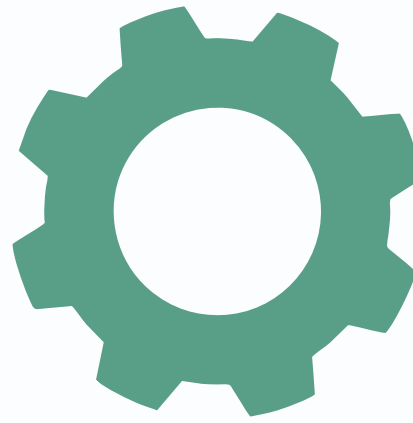
Exploring Medical Device Technologies

"A Journey into Innovation"

WRITTEN BY

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Dear readers,

This book, written by me, Hanae Chgari, is based on my experiences and observations assisting in a cardiology clinic under the surveillance of specialists. Influenced by technology and the revolution of machines, I have decided to concentrate on heart medical devices in my book.

The great achievement that technology has achieved in saving lives today intrigues me, and through this book, I hope to share some of my own experiences gained from my internship. As I take you through my experience in the medical device world, I hope that you enjoy and find value in my notes.

Introduction

The role of technology in our daily lives has always impressed me. Last summer, I had one unforgettable experience—an internship in a cardiology clinic. I learned a lot about heart machines during my internship and how the technology makes possible the rescue of people's lives every day. First, I was able to observe and learn from the experts who worked with these machines. Their design and mechanism posed a series of questions in my mind, which led me to ask the experts as well as do additional research on my own. The principal machines used in the cardiology clinic were: the echocardiography machine; the electrocardiograph (ECG or EKG); and the Holter monitor.

My dear readers, I hope you enjoy my experience at the cardiology clinic and learn more about the importance of these machines as well as how technology is saving lives every day.

HOW DOES THE ELECTROCARDIOGRAPH WORK ?

1 The ECG test

During my internship, the clinic welcomed about 30 people per day with many different forms of heart conditions for the ECG test. First, you may be asking: What's an ECG test? In 1901, Willem Einthoven invented the electrocardiograph, a remarkable medical device used to help doctors understand how the heart beats. Using small electrodes placed on the body, it measures electrical activity in the heart and amplifies these signals to produce a graph called an electrocardiogram (ECG or EKG). This is a sort of freeze-frame snapshot picture, necessary for identifying any problems related to the heart. With the ECG, doctors can detect problems like a heart attack or other cardiac conditions.

In an ECG test, you'll find yourself lying comfortably on a bed. A trained nurse or technician takes over, placing some rather small electrode patches on your chest and ankles.

When the electrodes are properly in place, a nurse connects them to equipment that records electrical activity generated by your heart. This machine draws a precise zigzag line on paper, which indicates the heart's rhythm and operation. The procedure itself is painless. All you have to do is sit still for a while.

The nurse then gives the paper bearing your heart's "electricity pattern" to the doctor. This pattern allows the doctor to determine how well your heart is performing. It's kind of like a snapshot of what your heart is up to right now.

This pattern gives the doctor an idea of your heart's condition. It's a little like taking your body temperature to see where you stand at that moment. The ECG test is a complicated yet simple method for the doctor to gather necessary information about your heart and detect possible problems.

How does the electrocardiograph contribute to saving lives?

While carrying out my internship, I looked into the records of some people and found that several had been suffering from heart disease for more than ten years. There are many reasons, depending on individual lifestyles and genetics. Statistics on global health show that cardiovascular disease is the biggest source of sickness and still causes some deaths. The electrocardiograph, or ECG machine, is important for people facing these problems. By recording the heart's electrical signals, it helps doctors detect problems at an early stage. Early detection is important because it means quick treatment, which saves many lives.

Echocardiography Machine (Echocardiogram):

In a heart test, or echocardiogram, the doctor looks at your heart without surgery. You lie down on a bed, usually left side. They put small patches on your chest to watch the electric signals in your heart.

The doctor uses a special tool he can hold in his hand called an ultrasound wand that sends out sound waves. The doctor takes a tool and places it on various areas of your chest. These noise waves go into your chest and bounce back as sounds when they hit your heart. This helps the doctor see what is happening inside you.

These sounds go to a computer that changes them into detailed pictures of your heart on screen. This lets the doctor check how big your heart is, what it looks like and how good it's at pumping blood. The test helps the doctor check if there are any issues with your heart valves, chambers or how blood moves.

During my internship, I saw that when a new patient came to the cardiology clinic or if the doctor needed to learn more about the patient's heart health, they would take them to a room with a big machine called an echocardiography machine. This device helps the doctor see detailed pictures of the heart's shape and how it works. So, the doctor can know the patient's situation better and make smart choices about their heart health. The echocardiography machine, also called an echocardiogram, is very important in medicine. It helps doctors find and understand heart problems. Doctor Inge Edler, a Swedish doctor, and engineer Carl Hertz made this new thing in the 1950s. The machine works by using loud fast sound waves to make detailed pictures of the heart's structure and how it works.

It has a device that sends out sound waves and a computer that reads the coming back echoes to make real-time pictures of the heart. The plan is not bothersome and makes it safer than old techniques.

Echocardiography helps doctors spot heart problems, check how well the heart is working and watch blood flow. This allows doctors to act quickly and make a treatment plan for patients with heart issues. This important tech has greatly improved how heart problems are found and handled. It has led to better results and improved care for patients.

Pacemaker and ICD (Implantable Cardioverter-Defibrillator)

In the second week of my Internship, I watched a nurse do an ECG test on a patient and it showed that there was a scar near his heart. The nurse told me that was because the patient had had surgery; he had an ICD (Implantable Cardioverter-Defibrillator) put in before all this happened. After some time spent getting used to these machines, they now work wonders. The artificial heart pacemaker and the Implantable Cardioverter-Defibrillator (ICD) is remarkable testimony to human ingenuity sophistication. Not just one person invented them; many clever scientists engineering experts of course also had their moment in history. To wit: Wilson Greatbatch, Michel Mirowski, or Morton Mower were all part of the unfolding developmental process that helped make these devices more effective. One benefit of this small minute engineering is as follows: If a patient requires a pacemaker, usually it is because their heart beats too slowly or irregularly. That pacemaker is a small device implanted beneath the skin, typically in the chest area. It sends out its electrical pulses to tell the heart when it must beat in order for things to go right. It is a helper to keep your heart in balance

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On the other hand, people who risk dangerous heartbeats, there are ICDs available. The ICD reads the heartbeat waveform and when this pattern appears abnormal, it delivers an electric shock to bring the heart back into its normal rhythm. It's as if there's a paramedic inside your chest.

these devices have been designed with the comfort of the patient in mind too. Small and normally consisting of substances that can be well tolerated by the human body, they are typically quite dollar. This means that implanting them in tissues is a routine operation and will usually result in few complications.

Let people enjoy better lives with their wonderful devices even with a heart condition. To make hearts operate correctly, they ensure the heart beats right. Thanks to these friendly little rascals people can live without fear of their heart suddenly acting up and take part in ordinary activities again.

The Holter monitor

is a nifty device that helps doctors keep an eye on our hearts. It has not been made by only one individual, but a number of intelligent minds took part in making the device fabulous.

But when might someone need to use a Holter monitor? Well, it is like an investigator of the heart for when the doctor suspects some fishy behaviour in our heart rhythms. If there is a fluttering heartbeat or if the doctor wants to have a look at how the heart performs over an extended period that is when they might whip out the Holter monitor.

The Holter monitor, well, it's sort of like James Bond that you wear on your chest. This is a small gadget that you stick on your chest using adhesive patches. In order to carry it around for about **24** hours to **48** hours, you can put its wires on your pocket and walk with them wherever you go. While this goes on, all cardiac activities are recorded by this holter monitor.

How does it work?

It listens silently to heartbeats and saves them up, thus acting as a kind of diary of the heart. Then, the doctor goes through this diary to check if there are any abnormal occurrences or tendencies which need attention.

The design is simple and functional. The item may be comfortable going about its task as you enjoy your day in silence. When the monitoring period ends, you return the Holter monitor and your heart has written an adventure report for the doctor.

This little device is very useful. It's the closest thing to bringing in a private eye to find out what's wrong with you from within and keep your heart healthy.

Conclusion

I learned a lot during my internship. Firstly, I got to know about the fact that our everyday lives are influenced by medical devices. Each of the patients who come to the clinic has various tests done on them using machines that evaluate their health and monitor their improvement.

By watching how designs are made, it was clear that engineering is very important towards improving people's lives and healthcare provision. The majority of patients in the clinic were sick or in pain. Nonetheless, under the guidance of medics and with these machines around, it was pleasing to see their conditions improve drastically hence bringing relief to many who had been suffering. As a result, I realized that technology combined with medical professionals positively impacts individuals' wellness state as it contributes toward wellness state and happiness of individuals.

In the medical industry, engineering is a revolutionary and life-saving force. Engineers develop cutting-edge medical technologies such as diagnostic scanners and monitoring devices that improve healthcare diagnoses and interventions. They help in making solutions that have improved the lives of many, for example prosthetics and implants for individuals with medical needs. In addition, engineers also use their ingenuity to come up with novel medical interventions such as targeted drug delivery or minimally invasive surgeries. The strong bond between medicine and engineering leads to the development of novel approaches in patient treatment, which improves care and sets new standards for global health care system. With brilliant scientists and engineers at work, it is possible to create these machines accurately. They are dedicated to developing innovative healthcare equipment.

REFERENCES

ALLIllustration, provided by Canva (www.canva.com),

"Information presented in this book is inspired by Hanae Chgari's internship experience at the cardiology Clinic of Dr. Saad Bennouna(15 Avenue Lalla Meriem, 30000 Fès, Morocco)."

"Dates, and nouns of inventors of machines provided by OpenAI's language model and Google Search (<http://www.google.com/>), (https://www.pfizer.com/news/articles/flashback_the_first_ecg#:~:text=Willem%20Einthoven%20found%20the%20beat,for%20more%20than%20a%20century), (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9365309/>),<https://bcmj.org/articles/ambulatory-electrocardiography-contribution-norman-jefferis-holter>) by OpenAI's language model. accessed in January 2024."

Through the world of medical devices, this book "Exploring Medical Device Technologies: A Journey into Innovation". takes readers on a captivating journey. It is a book that gives an in-depth understanding of medical devices and how they have significantly impacted human life. What could be more inspiring than the stories behind these devices and what they have done towards modern medicine? In other words, this journey into exploring medical device technologies is not just for anyone, it's for those who want to have more insight about transformational effect of medical devices.

Hanae Chgari, the writer of "Exploring Medical Device Technologies: A Journey into Innovation," presents a distinctive viewpoint in this respect, relying on her own experience of having been an intern at a cardiology clinic. Through this book, Hanae acquired knowledge from keen observation and working with specialists in the discipline. Hence Hanae Chgari weaves together her observations and the knowledge of experts to take readers into the exciting world of medical devices.