

A Specialised Field

Electrophysiology and Interventional Electrophysiology



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For over 26 years, Datuk Dr Azlan Hussin, Clinical Director, Interventional Electrophysiology & Implantable Devices / Senior Consultant Cardiologist, has been dedicated to understanding and treating heart rhythm disorders, particularly arrhythmias. This area of cardiology deals with abnormalities in heart rhythms, including both fast and slow heartbeats. Over the years, technological advancements have significantly improved the diagnosis and treatment of these conditions.

At its core, an arrhythmia refers to an abnormal heart rate. It can either be too fast (tachycardia) or too slow (bradycardia). The causes of arrhythmias can be both natural, such as genetic factors or underlying heart disease, or triggered by external events such as stress, medications, or electrolyte imbalances. These irregularities can be concerning as they disrupt the heart's ability to pump blood effectively, leading to complications ranging from fatigue to life-threatening events.

Over the years, technology has evolved considerably in the field of electrophysiology, transforming what was once a lengthy and intricate process into something more routine. When Dr. Azlan first began his work, certain procedures could take up to eight hours, but today, these procedures are often completed in much shorter time frames. As medical technology has improved, the tools available to diagnose and treat arrhythmias have evolved to the point where what was once challenging has now become standard practice.

Diagnostic Advancements: Implantable Devices

One of the most significant technological advances in arrhythmia diagnostics has been the development of implantable devices. These small devices are inserted under the skin and monitor the heart's electrical activity for extended periods, often 24 hours or more. In the past, doctors were limited by the short window of time they could monitor a patient's heart rhythm. Now, with these devices, doctors have a clearer and more complete picture of a patient's heart function.

Since their introduction about a decade ago, these implantable devices have seen improvements in their ability to record more complex heart rhythms and in their longevity. Early models had batteries that lasted around five to six years, but newer models can last much longer. The sophistication of these devices has also increased, allowing for more detailed monitoring and even remote data transmission to doctors.

Wearable Technology: A Step Forward for Patients

As wearable technologies like smartwatches have become more advanced, they have started playing a significant role in monitoring heart health. Devices like the Apple Watch, equipped with ECG capabilities, are FDA-approved and can track heart rhythms. These wearables are making it easier for patients to monitor their heart health at home and share the data with their doctors.

While these technologies are reliable and can provide useful information for diagnosis, they are not a replacement for medical-grade equipment. For example, the information collected from a wearable device, although accurate, requires medical verification before a diagnosis can be made. In some cases, patients come into clinics with data from their wearable devices, which has led to a shift in how patients and doctors interact, particularly in the US and Europe.

In Malaysia, wearable health technology is becoming more prevalent, though there are still some barriers to widespread use. While younger and more tech-savvy patients can benefit from these devices, older individuals, especially those less

comfortable with technology, may face challenges in using such tools. Moreover, the cost of some wearables, like the Apple Watch, might be prohibitive for certain segments of the population.

Artificial Intelligence in Healthcare

Artificial intelligence (AI) has begun to make its mark in the field of electrophysiology, particularly in the analysis of data from diagnostic devices. AI-assisted analysis of ECGs, for example, has been shown to outperform manual analysis in some studies, leading to more accurate diagnoses and faster treatment decisions. However, AI is not yet at the stage where it can independently make clinical decisions—it is a supportive tool that enhances human expertise.

Genetic Testing: A Tool for Personalised Treatment

Genetic testing has made significant strides, especially in identifying patients at risk for sudden cardiac death due to inherited arrhythmias. Genetic tests can identify individuals with conditions like Long QT syndrome, a disorder that can lead to fatal arrhythmias. In cases of sudden death within a family or survivors of sudden cardiac arrest, genetic testing becomes crucial in determining who else in the family may be at risk.

While genetic testing is still not widespread in the general population, it can be invaluable in high-risk families or in cases of unexplained sudden death. It allows for personalised treatment plans that can prevent fatal arrhythmias in susceptible individuals.

Treatment Modalities: From Catheter Ablation to Pacemakers

Treatment for arrhythmias can range from medication to more invasive procedures, with catheter ablation being one of the most common interventions for patients with fast heart rates. During this procedure, a catheter is inserted into the heart, and radiofrequency energy is used to destroy small areas of the heart tissue responsible for abnormal electrical signals. The development of new techniques, such as pulse-field ablation and cryoablation, has improved the efficiency and safety of these procedures, reducing the time required and minimizing the risk of complications.

Pacemakers, which are used to treat slow heart rates, have also evolved over the years. Traditional pacemakers required wires to be inserted into the heart, but newer models are wirelessly implanted and can directly deliver electrical impulses to the heart. These advancements have led to pacemakers that are smaller, longer-lasting, and more efficient in their function.

Advancements in Ablation Technology

As the field of electrophysiology continues to grow, there are ongoing improvements in ablation technology. Pulse-field ablation, according to Dr Azlan is a newer energy modality that has shown promising results in making the procedure safer and more efficient, with fewer complications. However, each energy source—radiofrequency, cryo, and pulse-field—has its own strengths, and the choice of energy modality depends on the patient's condition and the nature of the arrhythmia being treated.

Looking to the Future

The future of electrophysiology looks promising, with continuous advancements in technology, from diagnostic devices to therapeutic interventions. AI is expected to play a larger role in data analysis, and genetic testing may become more widely used in personalized treatment plans. With these innovations, patients are expected to receive more precise, timely, and effective care, improving both their outcomes and quality of life.

As these technologies evolve, it will be crucial for healthcare professionals to balance the benefits of new tools with the unique needs of each patient, ensuring that the most appropriate treatment is always provided.

A physiotherapist leads a patient through a carefully monitored rehabilitation session — a vital step in restoring heart health and confidence.

