

## **Creative Inquiry in Bioengineering**

### **Electrocardiogram Measurement and Modelling**

#### **BIOE 451-008**

#### **Project Description**

Heart disease is the leading cause of death in the United States, reportedly accounting or 26% of deaths. One specific heart disease that is increasing in prevalence is cardiac arrhythmia. Arrhythmia is a disorder where the beat of the heart is altered either by mechanical or electrical irregularities in the tissues. There is a direct correlation between age and risk of arrhythmia, thus with an ageing population the number at risk continues to rise. Treatment of cardiac arrhythmia is often curative as opposed to palliative, leading to direct improvements both in longevity and quality of life. Treatments can involve the use of antiarrhythmic drugs or surgical intervention. In the case of surgical intervention, often catheter-based procedures are performed, running from the femoral vein through to the left atrium. This procedure is complex and requires fine catheter skills and experience with a broad range of disorders. During a diagnosis and intervention in cardiac arrhythmia, biomedical signals such as EKG, pulse, respiratory cycle, and hear sounds are used. Additionally diagnostic imaging such as echocardiogram, intra-cardiac ultrasound, and fluoroscopy may be used. Practitioners and technicians are trained using a purely apprenticeship model, where training is performed directly on patients. This has two major disadvantages: first, the patient may be put at undue risk due to the lack of training that their team has, second, practitioner experience and training becomes a function of the specific institution they train at and further the specific cases they are assigned to. Modern technology in simulation has made the creation of virtual environments possible. This technology while widespread in many industries; has been slow to see adoption in the medical field.

In this creative inquiry we will examine the development of a simulation system for the training and rehearsal of surgery using actual patient data. As a team we will attempt to determine the factors that define a particular condition based on patient data and expert opinions. Further, we will devise a method of creating specific scenarios, and create a formal simulation, which can be directly translated to practice. In this CI experience, direct interactions with surgeons and other practitioners is possible, as is the ability to impact the training of new interventionalists..



## Thought Question:

When examining the EKG of a patient you notice a sequence of P waves with a QRS complex every 4-5 P waves, shown below as the red arrow. What do you suspect is happening within the heart?

