

## EP in Practice Course Design

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### Primary Course Aims

**The primary aims of the course is to enable participants to develop:**

1	The knowledge, skills, and professional abilities to competently perform cardiac Electrophysiology studies
2	A detailed understanding of cardiac anatomy, electrophysiology of the conduction system and potential for pathogenesis.
3	Proficiency in interpreting intracardiac electrograms, including identifying normal and abnormal conduction intervals
4	Proficient in understanding the biophysics of radiofrequency, pulsed field and cryoablation biophysics.
5	Proficiency in understanding the clinical significance of abnormalities detected in EP studies
6	Proficiency & understanding of various ablation techniques and procedural endpoints during therapeutic interventions for cardiac arrhythmias.
7	Insight into the pathophysiological processes and mechanisms of cardiac arrhythmias

## Course Learning Outcomes

In successfully completing the course, students will be able to:

1	Make inferences about possible differential diagnosis and likelihood based on patient demographic, history, 12 lead ECG features and description of symptoms.
2	Explain the specific pathophysiology & anatomy relevant to individual cardiac arrhythmias
3	Identify & appropriately measure intervals commonly measured in EP using electrograms
4	Explain & suggest appropriate pacing manoeuvres used to diagnose and differentiate arrhythmias.
5	Be competent in executing and interpreting the results of pacing manoeuvres used to differentiate & diagnose arrhythmias.
6	Be able to analyse and predict the arrhythmia and it's anatomical origin based on the 12 lead ECG.
7	Identify relevant signal morphology and electrogram activation patterns for each arrhythmia
8	Be comfortable in communicating the findings of an Electrophysiology study and manoeuvres.
9	Describe the utility and accurately interpret 3D Electroanatomical activation and voltage maps

## Course Overview

EP in Practice consists of the following 7 programs

<b>Online Programs</b>	1	Introduction to EP
	2	Supraventricular Tachyarrhythmias
	3	Rare & Complex SVT
	4	Atrial Flutter & AV node ablation
	5	Atrial Fibrillation
	6	Idiopathic ventricular arrhythmias
	7	Scar related Ventricular arrhythmias

## Program 1: Introduction to EP content

Anatomy & Physiology	Basics of the EP Study
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Cardiac anatomy</li><li>II. Basics of electrophysiology</li><li>III. Anatomy of the SA node &amp; Surrounds</li><li>IV. Anatomy of the AV Node &amp; Surrounds</li><li>V. Anatomy of the distal conduction system</li></ol> <p><b>Quiz: Anatomy &amp; Physiology</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Basics of Electrophysiology Study I</li><li>II. Basics of EPS II: Introduction to EGM's</li><li>III. Basics of EPS III: Nomenclature &amp; measurements in EP</li><li>IV. Basics of EPS IV: Pacing Protocols</li><li>V. Basics of EP V: Electrophysiological phenomena in EP studies</li></ol> <p><b>Quiz: Basics of EPS</b></p>
Intro to Arrhythmia	Ablation Physics
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Re-entrant SVT</li><li>II. Focal SVT</li><li>III. Atrial fibrillation &amp; Inappropriate Sinus Tachycardia</li><li>IV. Atrial Flutter</li><li>V. Ventricular Tachycardia</li><li>VI. Diagnostic EPS: VT induction</li></ol> <p><b>Quiz: Intro to Arrhythmia</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Radiofrequency Ablation Biophysics I</li><li>II. Radiofrequency Ablation Biophysics II</li><li>III. Radiofrequency Ablation Biophysics III</li><li>IV. Cryoablation Biophysics</li><li>V. Pulsed Field Ablation Biophysics</li></ol> <p><b>Quiz: Physics of Ablation</b></p>
Other "Must Know's" in the EP Lab	
<ol style="list-style-type: none"><li>I. Potential Complications in the EP Lab</li><li>II. Investigating Syncope: Appropriate diagnostic testing modalities &amp; history taking</li></ol>	

## Program 2: Supraventricular Tachyarrhythmias

Atrioventricular Junctional Reentrant Tachycardia	Atrioventricular Re-entrant Tachycardia (AVRT)
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Introducing AVJRT</li> <li>II. Features of Dual AV Nodal Physiology</li> <li>III. Techniques for inducing AVJRT</li> <li>IV. Introducing entrainment &amp; post pacing intervals</li> <li>V. SA-VA &amp; Post Pacing Response</li> <li>VI. Post Pacing interval to confirm AVJRT</li> <li>VII. Mapping &amp; Ablating AVJRT I</li> <li>VIII. Mapping &amp; Ablating AVJRT II</li> <li>IX. Complexities &amp; Considerations during AVJRT Ablation</li> <li>X. AVJRT in 3D</li> <li>XI. AVJRT in 3D II – Advanced 3D mapping techniques</li> <li>XII. AVJRT Case Stud – Putting theory into Practice</li> </ol> <p><b>Quiz: AVJRT in the EP Lab</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Introducing AVRT: Overview of Accessory Pathway Conduction</li> <li>II. Introducing AVRT II: AVRT in the EP lab</li> <li>III. Induction techniques for AVRT</li> <li>IV. Confirming AVRT: SA – VA &amp; Post Pacing Interval</li> <li>V. Confirming AVRT II: Post Pacing interval &amp; VA dissociation</li> <li>VI. His-Synchronous RV Pacing</li> <li>VII. Parahisian Pacing</li> <li>VIII. Additional features &amp; Pacing manoeuvres</li> <li>IX. Retrograde Mapping &amp; Ablation</li> <li>X. Antegrade Mapping &amp; Ablation</li> <li>XI. AVRT in 3D: Point by point Mapping</li> <li>XII. AVRT in 3D: Open Window Mapping</li> <li>XIII. Case Study in Practice: AVRT Vs AVJRT</li> </ol> <p><b>Quiz: AVRT in the EP Lab</b></p>
Focal Atrial Tachycardia	Medical Perspectives, Case Studies & more information
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. P Wave localisation</li> <li>II. Focal AT: Mechanisms &amp; Characteristics</li> <li>III. Activation Mapping</li> <li>IV. EGM Morphology Matters!</li> <li>V. EGM's, Safety &amp; Ablation endpoints</li> <li>VI. VA Linking</li> <li>VII. Focal Atrial Tachycardia in 3D</li> <li>VIII. Case Study: "Smoking Gun"</li> </ol> <p><b>Quiz: Focal AT in the EP Lab</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Medically Managing SVT: A Medical perspective</li> <li>II. Case Study: "Mistakes were Made"</li> <li>III. Case Study: "A Stitch in Time saves nine"</li> <li>IV. Case Study: "Occam's Razor"</li> <li>V. Bonus: Differentiating JET from AVJRT</li> </ol>

## Assessment Details

### **Assessment Type**

- MCQ examinations spread throughout the programs & modules
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- PLAN: To build final IBHRE preparation exam consisting of MCQ and short answer questions

### **The exams consist of all relevant materials relating to the learning programs & topics and examine the participant's ability to answer questions as follows:**

- i) Identify the pathophysiology, mechanism and anatomy relevant to each arrhythmia
- ii) Able to interpret electrograms & report likely arrhythmia diagnosis
- iii) Identify & interpret pacing manoeuvres results to differentiate arrhythmia diagnosis
- iv) Identify & signs of complication risk during cardiac ablation of arrhythmias
- v) Identify positive predictors for success for cardiac ablation of arrhythmias
- vi) Recognise & interpret 3D electroanatomical voltage and timing maps of various arrhythmias

### **Length**

- Program 1 & Program 2 consist of 210 Multiple Choice Questions with instantaneous feedback for correct & incorrect answers.

## Feedback Tools

- The results of the quizzes will be aggregated & analysed for each individual topic for EP in Practice programs. This enables us to identify opportunities to improve the weakest part of our content.
- Furthermore, students and website users will be provided access to feedback forms consisting of tailored multiple-choice questions and open-ended questions aimed at improving the standards of education and assessment.

## Program 4: Atypical SVT's

Rare Accessory Pathways	Unusual arrhythmias encountered in the EP lab
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Atriofascicular Accessory Pathways Characteristics of Tachycardia</li> <li>II. Atriofascicular Accessory Pathways: Response to Pacing Manoeuvres</li> <li>III. Atriofascicular Accessory Pathways: Mapping &amp; Ablation</li> <li>IV. Nodofascicular &amp; Nodovertricular Accessory Pathways Characteristics</li> <li>V. Nodofascicular Accessory Pathways Differentiation &amp; Ablation</li> <li>VI. Permanent Junctional Reentrant Tachycardia</li> <li>VII. Fasciculoventricular fibres</li> </ol>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Junctional Ectopic Tachycardia Part I</li> <li>II. Junctional Ectopic Tachycardia Part II</li> <li>III. Cardioneural Ablation for Vasovagal Syncope</li> <li>IV. Dual AV Nodal Non Reentrant Tachycardia "Double Fire Tachycardia"</li> <li>V. Peeling back Refractoriness – An underrecognised EP phenomenon</li> <li>VI. Case Study: Complex SVT differentiation</li> </ol> <p><b>Quiz: Atypical SVT's in the EP lab.</b></p>

## Program 3: Atrial Flutter

Typical CTI Dependent Atrial Flutter	Atypical Atrial Flutter
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. Typical Atrial Flutter - Overview</li> <li>II. Typical Atrial Flutter – Halos, EGMs &amp; Trans-isthmus times</li> <li>III. Typical Atrial Flutter - Entrainment</li> <li>IV. Typical Atrial Flutter – Ablation &amp; Checking for Block</li> <li>V. CTI Flutter ablation in 3D</li> </ol> <p><b>Quiz: Typical Atrial Flutter</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"> <li>I. RA Atypical Flutters</li> <li>II. Mitral Isthmus Flutter I</li> <li>III. Mitral Isthmus Flutter II</li> <li>IV. Other Left Atrial Flutters</li> <li>V. Atypical Flutters utilising epicardial Structures</li> </ol> <p><b>Quiz: Atypical Flutters</b></p>

## Program 5: Atrial Fibrillation

Atrial Fibrillation	Pulmonary vein isolation
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Atrial Fibrillation Pathophysiology &amp; Overview</li><li>II. Atrial Fibrillation Risk Factors</li><li>III. Medical management options for atrial fibrillation</li><li>IV. The role of atrial fibrillation ablation: reviewing the evidence</li></ol> <p><b>Quiz: Atrial Fibrillation</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. PVI with Cryoablation</li><li>II. PVI with Pulsed Field Ablation &amp; comparison to thermal outcomes</li><li>III. PVI with Radiofrequency Ablation</li><li>IV. Safety Considerations for Thermal PVI</li><li>V. PVI with emergent technologies &amp; techniques</li><li>VI. PVI ablation techniques &amp; pacing manoeuvres</li></ol> <p><b>Quiz: Pulmonary Vein Isolation</b></p>
Extra-Pulmonary Vein Ablation	Managing recurrent atrial fibrillation
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Posterior wall isolation</li><li>II. Targeting low voltage regions (ERASE-AF)</li><li>III. Posterolateral Mitral isthmus lines</li><li>IV. SVC isolation</li><li>V. Coronary Sinus isolation</li><li>VI. LAA isolation &amp; Occlusion</li></ol> <p><b>Quiz: Adjunctive atrial Fibrillation techniques</b></p>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. Reisolating veins in redo AF</li><li>II. Redo-AF – Targeting Non-Pulmonary Vein Triggers</li><li>III. Epicardial structures Contributing to AF Recurrence</li><li>IV. PACE &amp; Ablate: The end of the line</li><li>V. Recorded 3D AF Ablation Case Study</li></ol> <p><b>Quiz: Managing recurrent AF</b></p>

## Program 6: Idiopathic VT & PVC's

Localising VT using the ECG	PVC & idiopathic VT Ablation
<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. LV VT localisation</li><li>II. RV VT localisation</li><li>III. Advanced features of VT localisation</li><li>IV. Predicting epicardial exit sites</li><li>V. Idiopathic PVC's and activation mapping (I)</li><li>VI. Idiopathic VT Pacemapping &amp; Response to &amp; Ablation (II)</li></ol>	<p><b><u>Lectures</u></b></p> <ol style="list-style-type: none"><li>I. LV Summit PVCs</li><li>II. Idiopathic VT in 3D Case Study</li><li>III. Fascicular VT: Overview, mechanism &amp; Mapping</li><li>IV. Fascicular VT: Mapping &amp; Ablation strategies</li><li>V. PVC-induced Idiopathic Ventricular Fibrillation Overview (I)</li><li>VI. PVC-induced VF ablation (II)</li><li>VII. Rapid Fire Case studies x3!</li></ol> <p><b>Quiz: Idiopathic VT quiz</b></p>



## Program 7: Scar VT

### Scar VT Ablation Fundamentals

### Arrhythmic management of Cardiomyopathies

#### Lectures

- I. The role of Scar VT Ablation.
- II. Components of a VT circuit
- III. Entrainment mapping during VT Ablation
- IV. Fundamentals for identifying VT substrate I
- V. Fundamentals for identifying VT substrate II
- VI. Pacemapping in scar-related VT
- VII. Advanced Techniques for identifying VT substrate – Voltage
- VIII. Advanced Techniques for identifying VT Substrate – Functional mapping
- IX. Role & Utility of Imaging (ICE & MRI )
- X. Substrate Ablation Strategies
- XI. Miscellaneous VT concepts

#### Lectures

- I. Evolution of infarct scar
- II. Bundle Branch Reentry VT
- III. Medical considerations for managing ischemic Cardiomyopathy
- IV. Dilated Cardiomyopathy
- V. Arrhythmogenic (Right) Ventricular Cardiomyopathy
- VI. Sarcoid Cardiomyopathy
- VII. Hypertrophic Cardiomyopathy
- VIII. Tetralogy of Fallot
- IX. VT arising from the Cardiac Crux
- X. Rapid Fire Case Studies!

**Quiz: Electrically managing cardiomyopathies**