

BSc in Medical Sciences with CARDIOVASCULAR SCIENCES

Introduction

The BSc in Medical Sciences with Cardiovascular Science course is designed to provide a thorough understanding of the scientific basis of cardiovascular disease and how this relates to diagnosis and treatment. The course focuses on the main cardiovascular disease areas and has a strong translational emphasis. The normal functioning of the heart and vasculature, the mechanisms that are involved in a particular disease, how these affect individual patients and populations and finally the scientific basis of established and novel treatments will be discussed in detail. There will also be an introduction to the principles of epidemiology, diagnostic imaging and therapeutic strategies as applied to cardiovascular disease.

It aims to create clinicians and academics with the ability to interpret and inform best practice, and to extend boundaries of current thinking and advance medicine. It also provides the foundation in scientific methodology and analytical approaches from which the student can grow into a competent clinician and clinical researcher that could lead to postgraduate research studies.

Course Director

Dr Fu Siong Ng: f.ng@imperial.ac.uk

Personal webpage: <https://www.imperial.ac.uk/people/f.ng>

Course Administrator

Uzma Chaudhary: cvbscteach@imperial.ac.uk

Aims and Objectives

The course will give a firm grounding in the scientific foundations of the study of cardiovascular disease.

Learning outcomes

By the end of the course, students will:

- Demonstrate a sound knowledge and understanding of cardiovascular science, extending to current research controversies and challenges.
- Understand and critically appraise scientific evidence on which this cardiovascular science knowledge is based.
- Understand and apply the fundamental methods, principles and practice of scientific research within the field of cardiovascular sciences.
- Be able to relate scientific knowledge to the epidemiology, investigation, management and treatment of cardiovascular disease.

Content

The course will comprise a 12-week teaching block (Module 1) where students will gain specialism-specific knowledge and skills, alongside your research training of core research knowledge and skills. This is followed by a 5-week block for self-directed learning, focusing on appraising the literature and on clinical case studies. There is then a 14-week research project.

Module 1 (12 weeks): The science of Vascular disease
The science of Congenital heart disease and Arrhythmia
The science of Heart failure

Module 2 (5 weeks): Self-directed learning, independent & group work, clinical case study
Module 3 (14 weeks): Research project

Format of teaching

Module 1 involves a mixture of Face-to-face (F2F) on Hammersmith Hospital campus and MS Teams 'Live' (LOL) as well as Guided On-line (GOL) sessions including lectures, seminars, small group tutorials, journal clubs, debates, tutorials, discussions and practical classes delivered by leading experts in the field. Practical face-to-face teaching will take place on the Hammersmith Hospital campus in the first week of November 2023. The research project involves innovative research into a topic related to cardiovascular sciences or disease and is supervised by internationally recognised academics. Many former students have presented at national and international conferences and have published their project work.

Module One Lead and Deputy Course Director

Dr Graeme Birdsey g.birdsey@imperial.ac.uk
Personal webpage: <https://www.imperial.ac.uk/people/g.birdsey>

Dr Joe Boyle j.boyle@imperial.ac.uk

Assessment Lead

Personal webpage: <https://www.imperial.ac.uk/people/joseph.boyle>

Dr Nida Sajjad n.sajjad@imperial.ac.uk

Teaching Fellow

Personal webpage: <https://www.imperial.ac.uk/people/n.sajjad>

Module 1: BLOCK 1 – The Science of Vascular Disease

Aims and Content

- To introduce students to the range of physiological functions performed by the vasculature.
- To understand normal vascular biology and its derangement in disease, with emphasis on atherosclerosis, hypertension and coronary artery disease.
- To understand the basic pharmacology of the cardiovascular system, including cellular and molecular aspects of vascular function.
- To discuss the epidemiology of vascular disease, preventive strategies and novel treatments.
- To introduce a range of surgical approaches on coronary artery disease.

Module 1: BLOCK 2 - The Science of Congenital Heart Disease and Arrhythmia

Aims and Content

- To understand the structure and development of the heart, including the cardiac myocyte, and the interconnections between myocytes.
- To understand the basis of congenital heart disease, its occurrence in the population, the clinical studies and treatment.
- To be able to describe the basis and the mechanisms that bring about contraction and relaxation of the myocyte (excitation-contraction coupling) in normal and diseased hearts.
- To dissect the electrical nature of the heartbeat and understand how the electrical properties of the heart can fail, giving origin to arrhythmia in individual patients and within populations.
- To have knowledge of developing technologies and novel approaches for imaging and treatment of arrhythmias.

Module 1: BLOCK 3 - The Science of Heart Failure

Aims and Content

- To understand the nature of cardiac contraction, how this is regulated and what causes it to fail.
- To discuss the different forms of cardiomyopathies and their molecular basis.
- To provide an introduction to the imaging techniques used to assess cardiovascular anatomy and function.
- To understand the methods to perform clinical trials in heart failure and discuss their impact and relevance for clinical practice.
- To explore established and novel therapeutic strategies in heart failure, with special sessions on gene therapy and stem cell therapy. The physiology of cardiac regeneration will be explored and current views on reactivation of cell cycle as treatment strategy will be discussed.

Module 2: self-directed learning, involving a literature review and a clinical case study (Science in Context)

Module Lead

Dr Michela Nosedà m.nosedà@imperial.ac.uk
Personal webpage: <https://www.imperial.ac.uk/people/m.nosedà>

Dr Brian Halliday b.halliday@imperial.ac.uk
Personal webpage: <https://www.imperial.ac.uk/people/b.halliday>

Aims and content

Literature review: Assessment of group work and appraisal of literature and evidence base:
Group literature review - critical appraisal and rebuttal: Students will submit review, refereed review and revised review.

Clinical case study based on current and emerging evidence and guidelines. Students will visit clinics, catheter laboratory and wards for induction and receive clinical case study and scenario tutorials.

Module 3: Research project

Project Lead

Dr Dan Keene d.keene@imperial.ac.uk

Personal webpage: <https://www.imperial.ac.uk/people/d.keene>

Project

Supervisors will present proposed projects at the 'Meet the Supervisor' session during Block 1. Students will be encouraged to contact Supervisors should they wish to agree a project. A wide variety of laboratory-based and clinical based projects will be offered.

Past BSc Project Titles in Cardiovascular Sciences

- The prognostic significance of mid-wall fibrosis in dilated cardiomyopathy
- Developing a novel oxidised LDL (oxLDL) -based assay to measure anti-oxidant reserve in patients.
- Automatic identification of global features and local features of the human heart
- Mechanical load contributes to the maintenance of the conductive properties of myocardial slices in culture
- A comparison of the effects of fibroblasts and myofibroblasts on electrogram morphology
- Investigation of small molecules with potential for reversing primary contractile abnormalities of hypertrophic cardiomyopathy
- Towards a model of risk for cerebral abscess due to endovascular bacteria in patients with pulmonary arteriovenous malformations
- The effect of AV delay on exercise capacity in patients with biventricular pacemakers and heart failure
- Investigating the contractile function of beta-adrenergic receptors in mouse atrial cardiomyocytes.
- Establishing and refining a CT scanning and 3D printing pathway for congenital cardiac morphology specimens
- Uncovering Individual Patient Responses to Heart Rate Optimisation for Cardiac CT
- UPGRADE-HCM: Ultra-high ECG predictors of arrhythmia and desynchronisation evaluation in hypertrophic cardiomyopathy.
- Inspect, Respect, Incise: a novel non-resection repair technique for degenerative mitral regurgitation

What do the students think of the BSc in Cardiovascular Sciences?

'I liked the way it was a very gradual course where each previous lecture served as an introduction to the next which enabled deeper understanding of the course. Also, the lecturers were very helpful and very efficient with answering our questions which made us feel reassured.'

'Taught modules involve a mixture of lectures, seminars, small group tutorials, journal clubs, demonstrations and practical classes delivered by leading experts in the field.'

'The research project involves innovative research into a topic related to cardiovascular sciences or cardiovascular disease and is supervised by a member of academic research staff, who are internationally recognised leaders in their field. Many former students have presented at national and international conferences and have published their project work.'

'Overall, it was a great course and there are no negative aspects worthy of mention.'

'Cardiovascular Sciences is a challenging yet enjoyable BSc choice. An excellent, well organised BSc course, with variety, highly enthusiastic lecturers and a few laughs along the way!'

