

# Surgical Design, Technology, and Innovation (SDTI)

## Intercalated BSc

The BSc provides an opportunity to study the way in which surgery is being radically changed by new research, and the emerging disruptive surgical technologies and innovations of the future. This course covers the process by which clinical surgical problems are identified, technological solutions are proposed, studies testing these interventions are designed, and how ultimately innovative technologies are implemented in a clinically safe and responsible manner.

Throughout the BSc you will develop fundamental research skills that will prepare you for the practice and improvement of modern surgery. The BSc will particularly focus upon clinical research and surgical trials.

The BSc course is split into three modules – the taught component with lectures and practicals, a guided study component and then the independent research project. Spin down to look at pages 7-8 for more detail but for now just remember this:

The first module is split into three blocks, each reflects an aspect of the innovation process outlined above. The first block **'Design'** deals with the theory of designing surgical studies or trials and how innovative technologies are taken through to clinical use.

This is then reinforced in the second taught block **'Technology'** where students are given the opportunity to work with the world leading clinical and non-clinical scientists at Imperial College who will present innovative technology case studies that are at different steps in the development process.

The final taught block **'Innovation'** will be delivered by world renowned surgical innovators who will outline some of the exciting areas that emerging surgical technologies will offer to clinicians and surgeons of the future.

In addition, a wide array of research projects will be on offer to students of this course, varying from laboratory-based projects through to more clinically orientated studies, all of which will be under the guidance of the expert staff of Imperial College Department of Surgery and Cancer.

### Surgical Simulation

For you to appreciate the successful impact of surgical research in clinical practice, and to inspire you to go on and make improvements yourself the BSc includes several simulations for example: suturing, simulated ward, pop up theatre laparoscopy.

During these simulations you will have the opportunity to practice key surgical skills alongside surgical trainees. Some of the sessions will include the examinations that trainees undergo to give you a feel not only for the training but also how you would be assessed.

### Research Skills

The course will also provide opportunities to learn, practice, and develop key research skills that will be necessary for you to develop a career in medicine, dentistry or veterinary science.

- Reading papers
- Critical appraisal (basic science, clinical)
- Presenting papers
- Audits and ethics
- Innovation and brainstorming

### Assessment Briefings, Preparation and Practice

Some of these skills will be assessed during the BSc and to help guide then prepare you several sessions are timetabled to discuss the tasks and provide training.

- Letter to the editor
- Communication and storytelling
- Data analysis and abstracts
- Lit review/cases
- Project write up
- Project presentation

### Assessment Drop-in Sessions/Feedback

As you will learn in the course teamwork and supporting each other is vital to becoming a successful researcher and clinician. We have also timetabled three drop-in sessions to provide support for assessments and other aspects of the course you may be interested to discuss.

- Letter to the editor
- Videocasting
- Data analysis and abstracts

### Surgical Research

Finally, and most importantly some of the world's best clinical researchers are taking part in the BSc and will be talking to you about research within their chosen specialities. The teaching will combine to explain the research and translation pathways and show you how the clinical and non-clinical staff at Imperial are traversing them to improve the world and making it a better place to live. *Pay attention – we expect some of you to do the same during your future careers!*

- Surgical trials, design, and delivery
- Translation and entrepreneurship
- Precision Surgery
- Urology Technology
- Neurosurgery
- Trauma
- Humans and healthcare economics
- Healthcare innovation
- Fracture management
- Urology innovation

## Staff Profiles

We have added some pictures to remind you to say hi if you see us about and about the college.

### **Director**

**Dr Richie Abel** is a senior Lecturer in Musculoskeletal Sciences working in collaboration with clinicians, engineers and materials scientists studying what makes bone strong, how osteoporosis makes bones fragile and how treatments restore strength. Research is focussed on discovering why some people age healthily whilst others fracture, then using the knowledge to help us to find more effective tools for predicting and preventing fractures.



### **Deputy Director**



**Mr Stefan Antonowicz** is a Clinical Senior Lecturer and Honorary Consultant Surgeon in oesophagogastric surgery at Imperial with research interest is OG cancer biochemistry.

### **Module 1 Assessment Lead**

**Dr Eduardo M. Normando** is a clinician scientist, Senior Lecturer at Imperial College London and Consultant Ophthalmologist at the Western Eye and Charing Cross Hospitals. He is also a member of the Imperial College Ophthalmic Research Group (ICORG) Clinical Trials Unit, and his research is focused mainly on innovative non-invasive retinal imaging techniques and their applications in assessing novel therapeutic strategies for ophthalmic and neurodegenerative diseases.



### **Module 2 Lead (Literature Review)**

**Dr Emma Carrington** is a Clinical Senior lecturer and Consultant Colorectal Surgeon at Imperial College, London with a special interest in anorectal function and pelvic floor surgery. She graduated from Imperial College with a 1st Class degree and was supported by a Royal College of Surgeons fellowship during her PhD in neurogastroenterology at Queen Mary University of London. She has a clinical interest in benign proctology, pelvic floor surgery and neuromodulation in addition to minimally invasive colorectal surgery, inflammatory bowel disease and intestinal failure.



### ***Module 2 Lead (Science in Context)***

**Miss. Aimee Di Marco** is a Consultant Endocrine Surgeon at Imperial College NHS Trust and an Honorary Senior Lecturer, performing neck endocrine and adrenal surgery. She was awarded the medal for the highest scoring candidate in the FRCS. Her research interests include surgical technology (on which she undertook her PhD) the appraisal of novel technology in endocrine surgery and endocrine surgical pathology in women of reproductive age.



### ***Module 3 Lead (Projects)***

**Mikael Sodergren** is a Consultant Hepatobiliary and Pancreatic Surgeon at Imperial College Healthcare NHS Trust and a Senior Clinical Lecturer. His clinical interests include complex pancreas, liver and gallbladder cancer surgery as well as laparoscopic and robotic approaches. His research portfolio is based on novel technological innovation and therapeutics in the following major themes: immunomodulatory cancer therapies, medical cannabis research, surgical devices and medical eye-tracking.



### ***Teaching Fellow***

**Joana Dos Santos** is the Teaching Fellow for the BSc in Surgical Design, Technology & Innovation. Joana is a Bioengineer, specialised in Stem Cell Research and Tissue Engineering. Joana's PhD research focused on the development of a 3D leukaemia biomimicry, culturing AML and CLL patient samples in a polyurethane scaffold for long-term study of disease progression. Currently, Joana specialises in teaching research skills in the medical curriculum and works with specialists in the field to produce engaging teaching sessions.



***Education Administrator***

**Abid Ahmed** is the Course Administrator for the BSc in Surgical Technology and Innovation based at the St Mary's Campus.



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## Staff Contact Details

Here are our contact details for when you need to get in touch. We do not bite, and we want to support and empower you all to do well. If you do have a question, tell us your thinking and explain what you think the answer might be, so we don't just feel like we are doing all the work for you.

Role	Name	Title	Email
Director	Dr Richie Abel	Snr Lecturer in Musculoskeletal Sci	<a href="mailto:richard.abel@imperial.ac.uk">richard.abel@imperial.ac.uk</a>
Deputy Director and Module 1 Lead	Mr Stefan Antonowicz	Consultant Surgeon in oesophagogastric surgery	<a href="mailto:s.antonowicz@imperial.ac.uk">s.antonowicz@imperial.ac.uk</a>
Module 1 Assessment Lead	Eduardo Normando	Consultant Ophthalmologist and Clinical Snr Lecturer	<a href="mailto:e.normando@imperial.ac.uk">e.normando@imperial.ac.uk</a>
Module 2 Lead (Lit review)	Dr Emma Carrington	Consultant Colorectal Surgeon	<a href="mailto:emma.carrington@imperial.ac.uk">emma.carrington@imperial.ac.uk</a>
Module 2 (Case Studies)	Miss Aimee di Marco	Consultant Endocrine Surgeon	<a href="mailto:a.di-marco@imperial.ac.uk">a.di-marco@imperial.ac.uk</a>
Module 3	Mikael Sodergren	Clinical Senior Lecturer in Hepatopancreatobiliary Surgery	<a href="mailto:m.sodergren@imperial.ac.uk">m.sodergren@imperial.ac.uk</a>
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Course Administrator	Abid Ahmed	Education Administrator	<a href="mailto:abid.ahmed@imperial.ac.uk">abid.ahmed@imperial.ac.uk</a>

## Learning Outcomes

These are your friends that will guide you through the course. Practice each one and discuss among yourselves when they pop up in the course. Take extra special care to keep an eye out for the outcomes in blue.

### Professional Values and Behaviours

1. Understand and uphold the principles and ethics of academic integrity and quality
2. Maintain curiosity and thoughtfulness and be prepared to question “accepted” facts and theories
3. Demonstrate effective team and individual work

### Professional Skills

4. Manage, analyse and interpret research data, quantitative and qualitative evidence
5. Critically appraise the strengths and weaknesses of research work
6. Integrate different types of information and knowledge to justify a point of view
7. Design a robust study plan to address a research question
8. Communicate research effectively to a range of audiences

### Professional Knowledge

9. Demonstrate the understanding of the research pathway, including the rationale, characteristics and limitations of different research approaches
10. Demonstrate an understanding of the translation of research to the clinical forum as well as the application of an informed approach to patient care

## Surgery

### 11. Demonstrate an in-depth understanding of the chosen BSc subject:

- a) Explain how surgical devices are developed from concept to prototyping, and through to clinical testing and full clinical translation outlining potential pitfalls and points of failure
- d) Examine the challenges of implementing new surgical techniques and the processes necessary for these to be introduced safely into clinical practice
- c) Explain how analysis of long-term patient outcome data can lead to improved or personalised treatments for surgical patients

## Timetable and Assessment Overview

The taught component structure consists of a 12-week teaching block interspersed with consolidation weeks where students can commit to associated self-directed learning, on-line modules, group work etc, and will also provide an opportunity to meet with the course lead to discuss progress, issues, and to receive feedback on course work and progression.

### Scheduled Learning & Teaching

- Core skills-based curriculum
- Dynamic interactive teaching with blended materials
- Small group teaching (seminars, tutorials, debates, team-based learning, journal club, discussions)
- Laboratory practical's
- Clinical demonstrations
- Technology enhanced learning

## Module 1 Assessments (taught component)

There will be 3 in-course assessments during the taught component, each with a formative assessment.

### Written (15%)

Letter to the Editor of a journal addressing a topic within their specialty field (1000 words max) and in [Lancet Comment style](#). Figures and tables are not permitted. Examples of acceptable articles could include also: a topical or controversial paper in the field and a report of a major clinical study

### Oral (15%)

Oral Presentation: Video cast addressing either two conditions, or presentations, or underlying mechanisms within the field and identify similarities and differences in; for example, the (patho)physiologies, or the evidence for diagnoses, treatments and/or prognoses. Alternatively Identify a contentious topic in a surgical specialty that has not reached consensus.

### Data Management (70%)

- **Results Compendium: 70%:** (max 7 single figures/tables, and 1500 words max): Students will process, analyse, present, and discuss their results.
- **Scientific Abstract: 15%:** (350 words max): the following format should be followed: Background, Aim/Hypothesis, Methods (incl. stats), Results, Discussion/Conclusions, References
- **Lay summary: 15%:** (500 words max): (e.g.: a magazine/ newspaper article) Students will write a summary of their findings having in mind a non-scientific audience, keeping a good balance between factual and anecdotal style and taking care not to overstate conclusions.



## Module 2 Assessments (self-study component)

There are 2 in-course assessments during the self-directed component, linked to learning outcomes in research skills and surgical knowledge. You will participate in a group task to produce a literature review article within surgery. As well as an individual 'Science in Context' clinical case study will form your second in-course assessment during this module. These two tasks will be completed simultaneously

### **Group Literature Review (15%)**

As part of a group, you will undertake a critical review of the literature under supervision from a clinical researcher. After completing the review your team will peer review another team's paper – while they review yours. Afterwards you will be able to write a rebuttal. This will be good practice for submitting grants and publishing papers during your career.

### **Clinical Science in Context (10%)**

An individual task where you will write a clinical case study for a patient. You will meet the patient in groups and the report must be written and prepared on your own. The study can cover emerging evidence and guidelines as well as information from patient contact and surgical experts.

## Module 3 Research Project (independent component)

You will undertake a 14- week research project under supervision. This module is largely self-directed learning, and you will be supported by academic skills workshops as well as welfare checks. You are also encouraged to also take part in local lab meetings with your supervisory groups.

You will write up their project work in the style of a research paper and give an oral presentation reflecting on your individual research journey and future research directions.

### **Research Paper (35%)**

Project write-up as a paper following author guidelines from a journal in the field.

### **Oral Presentation (10%)**

Project presentation also including the individual research journey.

## *That's all folks!*

Good luck, enjoy and don't stress. If your worried about assessments just stop and remember that clinical training is a long game and that one day you will get to transform people's lives. Which when you think about it is pretty amazing.