BMSc in Human reproduction, assisted conception and embryonic stem cells
2015-6

University of Dundee

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Introduction

Infertility is a common problem, affecting one in seven couples. Assisted Reproductive Technology (ART) is the predominant treatment, which contributes to approximately 2% of births in the UK. IVF is a very profitable worldwide business with 70% of the UK cycles being privately funded. It is a rapidly growing field, for example the number of cycles in the UK has increased by almost 30% in the last 4 years. As such there is a clear need for medical students to have an up to date knowledge on these subjects and ability to analyse the subject critically. ART is consistently in the media and popular, interesting and stimulating subject for students.

Ninewells Assisted Conception Unit in Dundee was set up by Dr John Mills and Dr Geoff James, which resulted in the birth of the first in vitro-fertilisation (IVF) baby in Scotland in September 1984. It is a prestigious unit providing high quality patient care, with over 3,000 babies born so far. The staff of 30 have recently moved into a state-of-the art facility with the addition of new IVF laboratories facilities and currently treats about 700 IVF cycles per year. There are close working relationships between Ninewells Assisted Conception Unit and the University of Dundee, allowing the development of pioneering clinical and research developments.

Since Bob Edwards first described the maturation of human oocytes in vitro back in 1965, there has been an explosion of research in the field of human reproduction, resulting in an improved understanding of human reproduction and as a consequence ever increasing IVF success rates. Dundee University has obtained a world known reputation for cutting edge research in human embryology, in particular the understanding of human gamete (sperm and egg) and key identifying factors in the normal process of the union of gametes (in vivo and in vitro) and subsequent development of human embryos.

It is against this exciting background that we have introduced this BSMc, which focuses on placing the scientific principles of human embryology in a clinical context. Students undertaking this BSMc are able have clinical exposure to ART, perform laboratory or clinically focused research and gain an increased understanding of the scientific involved in ART.
Module 1: Term 1
Basic Clinical and Laboratory Science in Reproductive Health
Module Lead Convenor: Vanessa Kay

During your BMSc year it is important to have an understanding of the clinical aspects of reproductive medicine. Therefore students will have the opportunity to attend clinical sessions in the Assisted Conception Unit. These sessions will include clinics, theatre lists and sessions in the Assisted Conception Unit laboratory. Various clinical activities will be observed, including ultrasound scans, oocyte recoveries, surgical sperm aspirations and embryo transfers. Students will participate in taking structured histories from various patients attending for treatment.

Students are expected to give 3 oral presentations, based on an ACU quiz and 2 clinical cases they have seen. Students will attend a series of lecturers and tutorials on the fundamental science in ART. They will be required to submit 2 essays on an allocated topic related to ART.

Objectives

♦ In-depth understanding of basic science of reproductive physiology and gametogenesis.
♦ Sound grasp of factors contributing to male and female infertility
♦ Understand the investigations and the appropriate advice given for a couple attending an infertility clinic.
♦ Know the different causes of infertility, including unexplained infertility, anovulatory infertility, pelvic disease and male factor infertility
♦ Describe the range of treatments available in the assisted conception unit.
♦ Understand the type of treatment suitable for different infertility conditions.
♦ Describe the treatment stages involved in assisted conception treatment.
♦ Know the likelihood of success and the risks of different infertility treatments.
♦ Understand regulatory function of HFEA
♦ Be able to take and present a structured history from a couple or individual attending the assisted conception unit
♦ Perform literature reviews on different aspects of infertility diagnosis and management recognise and implement evidence based-medicine
♦ ability to retrieve, review and critically analyse scientific data
♦ communication of complex scientific concepts using appropriate methods, including verbal presentation and written work
BMSc Student Clinical Attachment to Assisted Conception Unit (ACU, ward 35)

The students will be expected to attend at least two clinics at least two theatre sessions and a session in the assisted conception laboratory during the first semester.

The workload in the ACU varies, so if there is little clinical activity on days you attend; please arrange to come on an alternative day when another student is not present. There are theatre lists on every weekday morning, but 4th year students are timetabled for some of these sessions (usually on Wednesday, Thursday and Friday, but please confirm with University secretary on ext. 33159). Clinics occur most days (please phone the ACU secretaries on ext. 36475 to confirm dates of clinics and starting times). It is important to ensure that no more than one student is present at each theatre session/per doctor in clinic. By the end of these clinical sessions, the student should be able to answer all the questions asked in the ACU quiz challenge (Appendix 1).

**WHAT TO EXPECT IN THE ACU**

When you arrive in the ACU, please sign in at the receptionist desk and identify yourself to a member of staff. Whilst in the department please do not wear any make-up, perfume or aftershave as studies have shown that strong scents may affect oocyte quality.

There are strict Human Embryo Authority regulations on confidentiality, which means that you will not be allowed to look at any patients’ notes. However the doctors and nurses in the unit may discuss individual patient management with you.

**Activities you may be involved in the ACU**

We will try to involve you in a variety of different procedures, so that you can obtain an insight to as many areas of assisted conception as possible. However, please recognise that this will depend on the workload on the day and the training needs of other member of staff. Moreover, infertility is a particularly sensitive area and therefore some patients may not consent to your presence.

**Procedures you may be involved with include:**

- Taking histories from a couple or individuals attending the assisted conception unit.
- Observing ultrasound scans performed in the department, including baseline scans, antral follicle counts, follicular tracking and early pregnancy scans.
Observing surgical procedures performed in the unit, including oocyte retrieval, surgical sperm retrieval and embryo transfer.

The embryologists may discuss their role in the unit and show you sperm, oocyte and embryo preparation.

**Infertility History**

The student is expected to take several detailed histories from patients attending for theatre or the clinic. Please use the attached history sheet proforma (Appendix 2). Ask the doctor on for the unit on your attachment day to consent appropriately selected patient/s for you.

**Assessment**

**Clinical Presentations**

Students should attend clinics and theatre sessions and review relevant literature to research the answers to the questions in the ACU quiz (Appendix 1). The student will then ask to do a 15 minute power point presentation presenting their answers and answering questions.

Students should select 2 cases in which they have taken an infertility history from during the first semester. Students should ensure that these cases have different indications for infertility treatment. Ideally students should try to avoid presenting similar cases to that of their colleagues, to minimise repetition in presentation. The cases will be presented to clinical staff and other students. The first case will be presented at the end of October and the second by the end of November. Essays should be submitted by end of first semester.

1) **Presentation 1**: presentation of answers to ACU Quiz. This will involve the following:
   - Attend ACU clinics and theatre staff
   - Review the literature relating to the quiz questions
   - Perform a 15 minute power point presentation explaining the answers to the quiz questions

**Marks: 3 credits**

2) **Presentation 2**: case history with discussion of the patient’s indications for infertility treatment. This will involve the following:
   - Take a structured history from a couple/individual attending for infertility treatment
• Undertake a review of the clinical literature on the indication for infertility treatment in this case
• Perform a 15 minute power point presentation of clinical history and summary of the clinical literature review

Marks: 3 credits

3) **Presentation 3:** presentation with discussion on management issues related to infertility case. This will involve the following:

• Take a structured history from a couple/individual attending for infertility treatment
• Undertake a review of the clinical literature on the issues related to the infertility management in the presented case
• Perform a 15 minute power point presentation of clinical history and summary of the clinical literature review

Marks: 3 credits

**Essays**

Students will be allocated 2 essays related to teaching on basic reproductive science to complete by the end of the first semester on subject related to lectures and tutorials in this block. Each essay will be 3000 words. All assessments will be marked by two examiners and the score will be the average of their marks.

Marks: 21 credits
APPENDIX 1

ACU quiz challenge

1. What is the definition of infertility?
2. What is the incidence of infertility?
3. How many cycles of treatment do we do at Ninewells?
4. Where do our patients come from?
5. How much does IVF cost?
6. What proportion of IVF / ICSI cycles are self-funded (in our unit)?
7. What are the criteria for NHS funded treatment in Scotland (there are 11)?
8. What are the main indications for IVF and ICSI treatment?
9. How do we test for smoking?
10. Why do we assess ovarian reserve?
11. How do we assess ovarian reserve?
12. What happens if a patient has a low ovarian reserve?
13. Which drugs are used during an IVF ovarian stimulation cycle?
14. What are the complications of IVF treatment?
15. What are the complications of a surgical sperm aspiration?
16. At what embryological stage are embryos transferred?
17. What factors affect the success rate of an embryo transfer?
18. What issues are considered when deciding to transfer one or two embryos?
APPENDIX 2
FEMALE HISTORY

Name, age, parity

Patient Problem
• duration of infertility
• primary or secondary
• duration of relationship
• investigations to date
• treatment to date (including any previous treatment and details of different aspects of ACU treatment)

Gynaecological History
• menstrual history: age menarche/menopause, cycle frequency and duration: K = …/…, any dysmenorrhoea, menorrhagia, date of last menstrual period
• cervical smear history: date and result of last smear, ever abnormal, ever require treatment
• contraceptive history
• sexual history: frequency, libido, dyspareunia, timing with cycle
• vaginal discharge: colour, odour, vulval irritation, previous sexually transmitted disease
• previous gynaecological treatment or surgery

Obstetric History
• chronological order: year, gestation,
• paternity
• any problems: antenatal /intrapartum /postnatal,
• outcome: birth weight

Systematic Enquiry: including bowel and bladder symptoms

Past Medical and Surgical History

Drug History and Allergies: including recreational drugs

Family History: including genetic abnormalities

Social History: including occupation, partner, children at home, smoke cigarettes, alcohol consumption
PARTNER HISTORY

Name, age

Patient Problem
- duration of infertility
- primary or secondary
- duration of relationship
- investigations to date
- treatment to date (including any previous treatment and details of different aspects of ACU treatment)

Andrology History
- previous UTI or STI
- testicular damage
- previous surgery
- sexual history, including coital frequency, any erectile or ejaculatory problems
- previous andrology treatment

Fertility History: in chronological order: year, gestation, maternity, outcome

Systematic Enquiry

Past Medical and Surgical History

Drug History and Allergies: including recreational drugs

Family History: including genetic abnormalities

Social History: including occupation, partner, children at home, smoke cigarettes, alcohol consumption

Management plan:

Summary: this should be short with only 3-4 sentences.
Module 2: Term 2
Clinical Issue and Controversies in Assisted Reproductive Technology

Module Lead: Vanessa Kay

This module will enable students to gain the knowledge and understanding of complex concepts and issues involved in ART at both a scientific and clinical level. During this module, students will be allocated a patient to follow through a treatment cycle and consider all the different aspects of their care, including clinical, embryology, regulatory and financial issues. A series of lectures and small group works will address various controversial issues in ART, including how many embryos to transplant, long term risks of treatment, social egg freezing, biomarkers and reproductive tourism. Through case base discussion of clinical cases, a variety of ethical issues will be explored. Through role play, communication skills with patients regarding number of embryo to transfer will also be developed. The regulatory role of the Human Fertilisation and Embryology Authority (HFEA) will be explained, along with the national policies governing the practice of ART. Students will explore all the different issues that influence what effects the success rates in ART.

Objectives

♦ appreciate the ethical issues involved in ART
♦ ability to prepare documentation required for ethical approvals
♦ Detailed and practical knowledge of the HFEA and legislative and regulatory framework.
♦ appreciate the importance of team working and recognise the roles of different members of the multidisciplinary team involved in delivering ART treatment
♦ effective verbal communication of difficult information to patients
♦ Be able to use their knowledge, understanding and skills to describe
♦ Basic key clinical issues in ART and be able to present a discussion of key controversial subjects.
♦ Communicate complex scientific concepts using appropriate methods including verbal presentation.
♦ Take responsibility for own work.
Assessment

1) Essay on a Controversial Issue in ART
Students should write an essay on a controversial issue in ART. Students can select their own topic (but this should be approved by your mentor).
Examples of suitable topics include:

- Sex selection of embryos
- Social egg freezing
- How much regulation is enough
- Should IVF be available to all
- Does surrogacy make a child into a commodity
- Fertility treatment of same sex male couples
- Fertility treatment of woman over age of 42 years
- What information should recipients receive when selecting a sperm or egg donor?
- Should pre-implantation genetic screening be offered routinely?
- Time lapse imagery for embryo assessment
- Anonymous vs non-anonymous donation of gametes

Marks: 15 credits

2) Case Report

Objectives:

- understand infertility investigations performed before ACU treatment
- recognise life-style changes and medical treatments that can improve ACU success rates
- state the risk factors that should be discussed before ACU treatment
- understand how you can individualise success rates ACU treatment
- explain the factors that influence the decision regarding down regulation and ovarian stimulation and post embryo transfer support treatment regimes
- recognise factors during surgical procedures (e.g. oocytes recovery, surgical sperm recovery, embryo transfer) that influence success rates
- explain factors in the laboratory care of gametes and embryos that influence success rates
- review relevant HFEA regulatory issues regarding ACU treatment
- recognise importance of quality assurance in laboratory management
- consider financial issues related to access to treatment
Instructions:
Each student will be allocated a patient/couple starting ACU treatment, who will be consented for their treatment to be followed by a student. You will first meet your patient at their action scan appointment. You will observe her ultrasound scan.

You will attend her next appointment (date to be confirmed), which may either be another scan or an oocyte recovery. On the day of their oocyte recovery you will have the opportunity ask the patient/couple questions about her/their infertility investigations and treatment so far. You can use the history proforma provided to guide your questions. You may also review the patient’s notes, but this will require you completing a form and handing this in to the course administrator.

After the oocyte recovery, you will then observe the patient’s embryo transfer. This is usually performed 5 days after the oocyte recovery (including Saturday and Sundays). Please phone the nurses station in between 2-5pm on day 4 after embryo transfer to confirm that the embryo transfer is going ahead and the time of the procedure (01382 633835 or ext. 33835). If you are unable to contact a nurse, please phone an ACU secretary (01382 635745 or ext. 36745). On the day of embryo transfer, ask the embryologist involved if it is possible to be present during their counselling of patient and during any laboratory procedures, such as selection of embryo and embryo cryopreservation.

If possible you may also be present at various other stages of individual’s treatment e.g. surgical sperm aspiration, gamete cryopreservation. If for any reason you are unable to follow the patient to embryo transfer, please let the course administrator know, so you can be allocated another patient/couple. Please ensure you do not wear any make up, perfume or after shave when attending the ACU theatre.

Students will then write this up as a case for 50% of the marks for this module. The case report should not include any identifying information. It should include a summary of the patient’s presentation, management and outcome, followed by a discussion of points of interest from this case. Assessment will be based on:

- clear, concise and precise presentation
- identification of points of interest about the case
- understanding of various issues affecting couples management
- use of relevant literature to support your discussion

Marks: 7.5 credits
3) **Presentation**

Students should prepare and deliver a Power Point presentation on their case study. (25% of the marks for this module) The presentation should be a review and discussion on management issues related to the infertility case and should include:

a) a structured clinical history from the couple/individual attending for infertility treatment
b) a review of the clinical literature on the issues related to the infertility management in the presented case

Each student will present their clinical case as a 10 minute PowerPoint with 5 minutes for questions. Active participation from the audience of faculty and students is expected. The presentations will be marked on content, style and ability to ask/answer questions.

**Marks: 7.5 credits**
Module 3 Laboratory and Research Skills: Terms 1 and 2
Module lead: Prof Chris Barratt

Objectives:
- appropriate use of statistical tools
- perform basic laboratory skills related to research in ART
- recognise and implement evidence based-medicine
- ability to retrieve, review and critically analyse scientific data
- understand research design and ability to evaluate and critique research methodologies
- write a research thesis

Terms 1: During the first term students develop basic laboratory and academic skills to enable them to perform laboratory and clinical research. There will be a series of lectures and laboratory practical sessions, in which students will learn basic safe laboratory practice related to ART. Journal Clubs will allow students to apply their understanding of research design, statistics and critical appraisal to relevant research. At the end of the first term student will sit a laboratory skills assessment.

Term 2: At the beginning of term 2, students will be required to decide on a research topic and start to develop a research proposal. Students may chose a laboratory based project, a clinically based project or a project that combines both clinical and laboratory data. There will be a session on how to submit a research proposal to help students in the preparation of this. Once students have been chosen a project, they should arrange to meet up with their supervisor to discuss the proposal.

Students are required to submit a research proposal at by the middle of the second term. All research proposals require to be approved by the faculty member before a project can commence. Student will have time allocated for their research project during the second term. Students will be required to review the relevant literature in the subject area, will use relevant practical skills to execute the research project. At the end of the second term students will give a presentation on their review of the literature and experimental plans.

Assessment
Laboratory skills assessment
15 credits

Presentation of literature review, experimental plans
15 credits
Objectives

- appropriate use of statistical tools
- perform basic laboratory skills related to research in ART
- recognise and implement evidence based-medicine
- ability to retrieve, review and critically analyse scientific data
- understand research design and ability to evaluate and critique research methodologies
- ability to complete a high quality research thesis

Once students have had their research proposal approved in the second term, they can commence working on their research project. Time is allocated during the second term and all of the third semester will be dedicated to the project. Students will receive one to one supervision, with regular meetings to review progress throughout the second and third term. After each meeting with their supervisor, they should email their supervisor a summary of their discussion and a review the timing of deadlines for different aspects of their projects. The frequency of these meetings will depend on the type of project, but it is expected that they should have a review meeting at least every 2 weeks. During this time students will complete their project and write a detailed written report. This should be submitted by beginning of May 2016.

Research project detailed written report

30 credits