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Medical Student Experiences in Clinical Reproductive Medicine: Dual-Cohort Assessment of a New Learning Module at the Royal College of Surgeons in Ireland

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Authors' contributions

This work was carried out in collaboration between all authors. Author APHW was course director, author GSC was chief statistician and assisted with study design, authors DJW and LVS were clinical faculty, author FDM was Vice Dean and supervised the overall rotation and student feedback, author ESS conceived the study and developed the manuscript. All authors read and approved the final version.

Research Article

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ABSTRACT

Aims: Exposure to a structured curriculum in reproductive medicine during medical school is helpful given the high frequency of fertility and pregnancy-related issues that future physicians will encounter. This study sought to evaluate a new reproductive medicine module for medical students.

Study Design: Prospective cohort study.

Place and Duration of Study: Dublin, Ireland; 2008-2010.

Methodology: A new educational module in reproductive medicine for upper-level medical students was initiated in 2008 at the Royal College of Surgeons in Ireland (RCSI). The module included reproductive endocrinology lectures, laboratory sessions, and direct observation of clinical consultations as a required component of an obstetrics

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and gynaecology rotation. Students were assigned to this module on the basis of random allocation by departmental administration. The current investigation used an anonymous questionnaire and a MCQ exam to measure academic performance and student acceptance of this module, at launch and again two years later. The first sampling was from the pilot class in 2008 and a second group was evaluated in 2010. No student was in both groups.

Results: 42 of 66 students completed the evaluation in 2008, and 71 of 98 did so in 2010. Mean \pm SD medical student age and average examination scores were comparable for the two groups. In both samples, most students (95.5%) had no prior lectures on reproductive endocrinology, and most indicated improvement in their level of understanding after the module. Both laboratory and clinical features were scored highly by students.

Conclusion: At present, there is no standardised medical student curriculum for reproductive medicine in Ireland. This report is the first to describe a structured learning experience in this subspecialty area for medical students in Ireland. Additional studies are planned to track knowledge acquisition and career impact specific to reproductive medicine based on this module.

Keywords: Reproductive medicine; medical student; clinical education; Ireland.

1. INTRODUCTION

The medical student curriculum is characterised by high-intensity learning where considerable material must be mastered in a relatively short time [1]. Given the limited academic calendar available to cover this information, optimal management of the modern medical school curriculum requires frequent reappraisal [2,3]. Currently, medical students in Ireland have few learning opportunities specifically dedicated to reproductive endocrinology and infertility. Although reproductive medicine lectures may be included in the general obstetrics and gynaecology curricula, little practical application of material specific to the advanced reproductive technologies is routinely provided for medical students in Ireland. To address this need, the medical school of the Royal College of Surgeons in Ireland (RCSI) and The Sims Institute (Sims IVF) developed a clinical module in fertility/reproductive medicine for upper-level medical students beginning in 2008. This study presents data on this teaching initiative by measuring performance on standardised examinations, assessing effectiveness of clinical and laboratory teaching elements, describing student self-reported knowledge level of reproductive endocrinology at baseline, and reporting subjective appraisals of teaching quality associated with the overall educational experience.

2. METHODOLOGY

Students gain exposure to reproductive medicine as part of the mandatory obstetrics and gynaecology rotations, which are organised by agreements with hospitals having academic affiliation with medical schools across Ireland. For medical students at RCSI (Royal College of Surgeons in Ireland) where they undergo their obstetrics and gynaecology rotation is determined through random allocation by department administration. Students at one of these hospitals (Coombe Women's & Infant's University Hospital) participated in the current study, whereby they attended the experimental module outside the hospital campus. Students not allocated to the experimental module attended didactic sessions covering reproductive medicine provided at a hospital lecture auditorium. This investigation sought to

evaluate academic performance by students assigned to the clinical module (by MCQ exam), and measure acceptance (by voluntary anonymous questionnaire) among medical students at the end of the clinical module. To determine if these findings were consistent over time, assessments were taken at launch and again two years later.

For these students, their reproductive endocrinology instruction was provided by consultant-grade physicians and senior IVF laboratory staff based at The Sims Clinic (Sims IVF), a private institution situated in south Dublin. So as not to disrupt patient care and clinic flow, personnel at Sims IVF provided instruction to the medical students on a rotating basis; staff from Sims IVF did not receive any compensation from RCSI. Beginning in 2008, medical students rotated to Sims IVF for the two-day module in groups not exceeding four per session, with a different cohort entering each week. Because the module was launched after the 2008 academic year had already started, not all students from that class were able to participate. Students in 2008 and 2010 were sampled. The lecture timetable and clinic/laboratory schedule is shown in Table 1.

Table 1. Outline of RCSI reproductive medicine lecture/laboratory activities for medical students at Sims IVF

Tuesday	Wednesday
10:00-11:30A Welcome & introduction Epidemiology of infertility Approach to investigations	10:00A Transvaginal ultrasound (cycle monitoring) Documentation of intrauterine contours (SIS)
11:30-12:30P IVF, IUI, ovulation induction, medications and complications Application of test results, ovarian reserve Risk of multiple gestation – recent data	11:00A Human embryology laboratory (blastocyst culture, ICSI) Basic andrology: semen analysis Sperm DNA fragmentation : role in clinical practice
-open-	12:00N Theatre : Oocyte retrieval & embryo transfer
1:00-2:00P Ethical issues in the advanced reproductive technologies	1:30-2:30P Laboratory group presentation Video microscopy : gametes and embryos
2:30P Laboratory session : embryo transfer	-open-
	4:00P General review, questions & discussion Evaluation – student questionnaires + MCQ exam

Notes: RCSI=Royal College of Surgeons in Ireland; SIS=saline infusion sonography; IVF=in vitro fertilization; IUI=intrauterine insemination; ICSI=intracytoplasmic sperm injection; MCQ=multiple choice question.

All students were in their penultimate or final year of medical school. Students were provided with a syllabus and printed learning aids upon arrival, with maps, directions and other introductory materials provided on the centre's web-page (which the students were encouraged to access via internet before arrival). The module covered basic reproductive endocrinology, including hypothalamic, pituitary, gonadal, thyroid and adrenal processes. Infertility diagnosis and treatment, as well as a lecture on epidemiology of infertility and the risks of multiple gestation as a consequence of fertility therapy, were also discussed. The processes of controlled ovarian hyperstimulation, in vitro fertilisation and embryo transfer were described (and subsequently demonstrated) to the students with the assistance of Sims IVF patients who had specifically consented to assist in medical student teaching. The module also included information concerning ethical issues uniquely linked to assisted reproductive techniques, including gamete/embryo cryopreservation and the role of patient counselling to avoid custody disputes in the event that a couple pursuing fertility treatment should separate. Each session consisted of formal lectures, multimedia presentations on reproductive medicine topics by centre staff, and dedicated laboratory time. An introduction to regulatory, ethical, and legal features of clinical fertility medicine was provided, along with approaches to patient counselling and treatment involving known and anonymous donor gametes. Medical students shadowed attending staff with new and follow-up clinic appointments after patient consent was obtained. Students also observed assisted reproductive procedures including intrauterine insemination, oocyte retrieval and embryo transfer; in our laboratory students gained understanding of intracytoplasmic sperm injection, assisted embryo hatching, human embryo cryopreservation/thaw, and extended blastocyst culture by direct observation. Although not required, research work by medical students was encouraged. Some students already had a research concept but no experimental design, whilst others wished to initiate a research project *de novo*. Those with an interest in further work with our subspecialty faculty were encouraged to return to the clinical site after the module for help with their own project development, reviews of literature, data collection, statistical analysis, manuscript preparation/editing and submission.

At the conclusion of the clinical module, a one-page feedback questionnaire was completed by each participant. The questionnaire was developed by a multidisciplinary team including administrators, physicians, nurses, and students, while the MCQ exam covered the reproductive endocrinology material presented during lecture. Exam questions were derived from recent sample training tests for reproductive medicine available from the Royal College of Obstetricians & Gynaecologists and the American College of Obstetricians & Gynecologists. All multiple choice questions were presented in a "select the single best answer" format. Responses from questionnaires and MCQ exams were manually recorded for analysis. Differences between 2008 and 2010 responses for each question were evaluated by Fisher's exact test. Because no data were collected in an identifiable manner, IRB approval was not required for this voluntary study.

3. RESULTS

Evaluation of the clinical module in reproductive endocrinology commenced with its launch in the 2008 academic year, and involved 66 RCSI medical students. The same questionnaire was used to evaluate the 2010 cohort. Since the 2008 students had already graduated when the second evaluation was conducted, each student participated only once in the study. For students in the 2008 group, the questionnaire was fully completed by 42 of 66 students (63.6% response rate). Mean \pm SD medical student age in this group was 24.3 \pm 2.3. The 2008 sample of medical students comprised 22.7% males and 77.3%

females, representing nationalities of 17 countries. Among the 2010 students, the questionnaire was fully completed by 71 of 98 students (72% response rate). Mean±SD medical student age in this group was 25.1±2.9. In the 2010 group, 23.2% were male and 76.8% were female, representing nationalities of 20 countries. Mean MCQ scores for participants in 2008 and 2010 were not significantly different when compared by student's *t*-test: 78.9 (range 45-95) and 80.3 (range 52-92), respectively (maximum possible score=100). Nationals of Ireland accounted for 15-20% of students in both sample years. For assessments in both 2008 and 2010, the average rate of medical students with an earned graduate degree was 35.7%, and only 4.5% had any prior reproductive endocrinology coursework. Neither questionnaire responses nor MCQ scores were significantly different among medical students with a graduate degree compared to those without a graduate degree. Student responses to the questionnaire are summarised in Table 2.

Table 2. Summary of medical student questionnaire responses concerning a new reproductive medicine module in 2008 (blue) and 2010 (red).

	Response (%)				
	1	2	3	4	5
How important is formal exposure to reproductive medicine during medical school, in your opinion?	0 0	2.4 0	7.1 18.5	28.6 18.5	61.9 63
Before this experience at Sims, what was your general level of knowledge of reproductive medicine?	26.2 19.1	31.0 38.2	42.8 41.7	0 1	0 0
How would you assess the amount of time allocated to reproductive endocrinology in your schedule?	23.8 25.6	23.8 19.9	23.8 22.2	21.4 19.8	7.2 12.5
My questions about the advanced reproductive technologies were mainly answered at Sims.	0 0	0 0	7.1 0	28.6 30.1	64.3 69.9
I would have liked to spend more time observing specific ART procedures while at Sims.	2.4 2.5	7.1 7.7	26.2 20	11 16.7	52.4 53.1
What was the overall quality of lectures on reproductive endocrinology here, in your opinion?	0 0	0 0	0 0	35.7 39.1	64.3 60.9
What was the overall quality of learning material provided by the laboratories here?	2.4 0	0 0	4.8 1	31.0 36.9	61.8 62.1
How would you rate the opportunities for medical research & publishing for RCSI students at	2.4 0	0 0	19.0 10.3	16.7 19.6	61.9 70.1
What impact has the Sims rotation made on career decisions for your future medical practice?	2.4 2.2	11.9 14.9	35.7 33.8	35.7 33	14.3 16.1

Note: Data reported on a 1-5 scale, where 1=too low/strongly negative/disagree/oppose/inadequate, 2=somewhat low/slightly negative/slightly disagree/somewhat oppose/minimal, 3=intermediate/no opinion, 4=somewhat high/slightly positive/slightly agree/somewhat support/good, 5=very high/strongly positive/agree/support/excessive. For 2008, n=42; for 2010, n=71. For all data comparisons 2008 vs. 2010, *P*>0.05 (by Fisher's exact test).

4. DISCUSSION

The current study is believed to be the first published work describing teaching techniques specifically for clinical reproductive medicine in an Irish medical school setting. The field of reproductive endocrinology is among the more rapidly evolving areas of clinical practice,

although this pace of change has not been matched by the academic calendar in Irish medical schools. Moreover, medical schools must train future physicians to set individual priorities and to establish balances between preventive medicine and management of specific pathologies [4]—an even more pressurised task given the proliferation of sub-specialties. While reproductive endocrinology & infertility has been designated as a sub-specialty of obstetrics and gynaecology since at least 1973, medical students in Ireland currently have uneven exposure to this discipline. Considering the frequency of women's health visits that relate to pregnancy or attainment of pregnancy [5], tomorrow's physicians need to be familiar with basic reproductive endocrinology even if this is not their chosen area of professional practice.

Against this background, and recognising an opportunity to enhance the standard obstetrics and gynaecology curriculum for medical students, RCSI and Sims IVF developed a new reproductive biology clinical module in 2008. The new syllabus was commissioned to allow critical evaluation of clinical literature in an evidence-based, clinical environment for reproductive endocrinology specifically for medical students. The module was also designed to update new advances in fertility medicine and reinforce the importance of medical ethics, epidemiology, biostatistics, and experimental design [6].

The module provided exposure to the full range of advanced reproductive therapies including intrauterine insemination, oocyte retrieval, testicular sperm aspiration, intracytoplasmic sperm injection and embryo/blastocyst transfer. Because the new module was offered at the only facility in Ireland providing donor oocyte IVF [7,8], our students were able to directly observe a key aspect of reproductive treatment that would otherwise not be available without international travel. Another component of this new clinical module in reproductive medicine was the opportunity for mentoring, and to encourage medical student research. Work conducted in the United States has shown that medical student research activities can impact favourably on future careers; this outlet is not for everyone and many students do not think a research project should be required for graduation [9]. Although completing a research project was impossible given the module's brief duration, our students used this time to frame a research concept to which they later returned for completion—this generated downstream original research which was subsequently published with medical students as first [10] or second [11-13] author.

MCQ was used to measure the reproductive endocrinology knowledge level of students at the end of the module, and these results offer previously unreported data on Irish medical students. We believe these findings are particularly relevant considering student comments indicating that exposure to the advanced reproductive technologies was unlikely to come from other (i.e., non-obstetrics/gynaecology) clerkships or rotations. A similar need for additional training in the arena of reproductive endocrinology has been identified in a post-graduate setting in an ambulatory clinic environment [14]. While it has not been established that this deficiency will fully generalise to all medical students, our data suggest that, at least at the point medical students are undertaking their general obstetrics and gynaecology rotation, their self-reported level of knowledge about reproductive medicine may not be adequate.

Can evaluation of student performance in clinical reproductive endocrinology be inferred from responses to written exams and questionnaires? We believe it can. This approach has been validated as a reasonable measure of clinical experience in the general field

of obstetrics and gynaecology [15], even if the student enters the clerkship with no special background or other preparation. In this study, higher exam scores were not found among our students holding graduate degrees compared to those without this credential. This finding is consistent with previous research [16] suggesting that medical students with an advanced degree do not bring any particular advantage over their peers who enter medical school without already having earned a masters or doctoral level degree. In both 2008 and 2010 sessions, most students were not of Irish origin and a persistent 'gender divide' favouring female participation was observed. Since this module was part of a mandatory clerkship, it is not surprising that our demographic data were parallel with previous observations among medical school applicants [17].

Our study could have been strengthened by a comparison of pre- and post-test exam performance, and especially by measuring student responses obtained from those who were allocated to the standard (didactic) reproductive medicine rotation elsewhere in Ireland. Regrettably, it was not possible to arrange these assessment strategies. Since structured modules for reproductive endocrinology are a relatively new addition to the Irish medical school curricula, it has not yet been possible to compare various lecture/laboratory combinations. Our faculty plan to gather additional data on this to form the basis of further investigation.

4. CONCLUSION

The current report offers evidence for a consistent level of student acceptance for this new clinical module among RCSI medical students. Given the myriad vital topics and concepts distinct from reproductive biology which form a comprehensive medical education, additional study is planned to determine "how much time is enough" with respect to each constituent part.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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