



MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Super Specialty Courses

SYLLABUS

M.Ch. IN REPRODUCTIVE MEDICINE AND SURGERY

Notice

- Amendment made by the Medical Council of India in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.
- The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
- The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

RULES & REGULATIONS

M.Ch. IN REPRODUCTIVE MEDICINE AND SURGERY (.....)

Selection of Candidates:

There shall be a uniform entrance examination to all medical educational institutions at the Postgraduate level namely 'National Eligibility-cum-Entrance Test' for admission to postgraduate courses in each academic year and shall be conducted under the overall supervision of the Ministry of Health & Family Welfare, Government of India.

In order to be eligible for admission to Postgraduate Course for an academic year, it shall be necessary for a candidate to obtain minimum of marks at 50th percentile in the 'National Eligibility-Cum-Entrance Test for Postgraduate courses' held for the said academic year. However, in respect of candidates belonging to Scheduled Castes, Scheduled Tribes, and Other Backward Classes, the minimum marks shall be at 40th percentile. In respect of candidates with benchmark disabilities specified under the Rights of Persons with Disabilities Act, 2016, the minimum marks shall be at 45th percentile for General Category and 40th percentile for SC/ST/OBC.

The percentile shall be determined on the basis of highest marks secured in the All India Common merit list in National Eligibility-cum-Entrance Test for Postgraduate courses.

Provided when sufficient number of candidates in the respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test held for any academic year for admission to Postgraduate Courses, the Central Government in consultation with Medical Council of India may at its discretion lower the minimum marks required for admission to Post Graduate Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the academic year only.

The reservation of seats in Medical Colleges/institutions for respective categories shall be as per applicable laws prevailing in States/Union Territories. An all India merit list as well as State-wise merit list of the eligible candidates shall be prepared on the basis of the marks obtained in National Eligibility-cum-Entrance Test and candidates shall be admitted to Postgraduate Courses from the said merit lists only.

There shall be no admission of students in respect of any academic session beyond 31st August under any circumstances. The Universities shall not register any student admitted beyond the said date.

ELIGIBILITY FOR ADMISSION:

Candidates must meet the Master of Chirurgiae (M.Ch.) eligibility criteria required to get admission to MCh courses through NEET-SS.

Prior Requirement

MS (Obs & Gynae) OR DGO (Diploma in Gynae & Obs) with DNB OR Primary DNB (Obs & Gynae)

Common Counseling:

There shall be a common counseling for admission to all Postgraduate Super specialty Courses (DM/ M.Ch.) in all Medical Educational Institutions on the basis of merit list of the National Eligibility-cum-Entrance Test.

Period of Training:

The period of training for obtaining DM/M.Ch. Degrees shall be three completed years including the examination period.

Migration:

Under no circumstance, Migration/transfer of student undergoing any Super Specialty course shall be permitted by any University/Authority.

Staff - Faculty:

Only those teachers who possess 6 years teaching experience out of which at least 2 years teaching experience as Assistant Professor gained after obtaining the higher specialty degree shall be recognized post graduate teacher.

No teacher shall be considered as a postgraduate teacher in any other institution during the period till the postgraduate course at the institute which has been granted permission considering him as a postgraduate teacher is recognized u/s 11(2) of the Indian Medical Council Act, 1956.

Minimum staff required (Super-speciality):

- 1- Professor
- 1- Associate Professor
- 1- Assistant Professor
- 1- Senior Resident
- 2- Junior Resident

Training programme:

All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year (Academic Term of 6 months) including assignments, assessed full time responsibilities and participation in all facets of the educational process.

No candidate shall be permitted to run a clinic/work in clinic/laboratory/nursing home while studying postgraduate super specialty course. No candidate shall join any other course or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration.

Every institution undertaking Post Graduate training programme shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training programme in each speciality in consultation with other department faculty staff and also coordinate and monitor the implementation of these training Programmes.

The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the training undergone by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

Post Graduate students shall maintain a record (log) book of the work carried out by them and the training programme undergone during the period of training including details of surgical operations assisted or done independently by M.Ch. candidates.

The Record (Log) Books shall be checked and assessed periodically by the faculty members imparting the training.

During the training for award of Degree / Superspecialty in clinical disciplines, there shall be proper training in Basic medical sciences related to the disciplines concerned; so also in the applied aspects of the subject; and allied subjects related to the disciplines concerned. In the Post Graduate training programmes including both Clinical and Basic medical sciences, emphasis has to be laid on Preventive and Social aspects. Emergency care, facilities for Autopsies, Biopsies, Cytopsies, Endoscopy and Imaging etc. shall also be made available for training purposes.

The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to nonlinear mathematics shall be imparted to the Post Graduate students.

The teaching and training of the students shall include graded responsibility in the management and treatment of patients entrusted to their care; participation in Seminars, Journal Clubs, Group Discussions, Clinical Meetings, Grand Rounds, and Clinico-Pathological Conferences; practical training in Diagnosis and Medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialities.

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; with practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization. Postgraduate Superspecialty Residents in Surgical Specialties shall participate in Surgical operations as well.

A postgraduate student of a postgraduate degree course in super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

ENROLMENT AND REGISTRATION

Every candidate who is admitted to DM/MCh. course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled and registered with the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST) after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application to the MGUMST through Principal of College

for the enrolment/eligibility along with the following original documents and the prescribed fees within two months of his/her admission or up to November 30 of the year of admission whichever is later without late fees. Then after, student will have to pay applicable late fees as per prevailing University Rules.

- (a) MD/MS pass Marks sheet/Degree certificate issued by the University.
- (b) Migration certificate issued by the concerned University (in case the University is other than the MGUMST).
- (c) Date of Birth Certificate
- (d) Certificate regarding registration with Rajasthan Medical Council / Medical Council of India / Other State Medical Council.

No candidate shall be allowed to appear in University examination without his/her enrolment with the University.

ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATION

1. **Logbook:** Every candidate shall maintain a logbook for recording his/her participation in the training program conducted in the department. The logbook shall be verified and certified by the Department Head and Head of the Institution.
2. Every student would be required to present one poster presentation, to read one paper at a National/State Conference and to have one research paper which should be published/accepted for publication/ sent for publication to an indexed journal during the period of his/her post graduate studies so as to make him/her eligible to appear at the Post Graduate Degree Examination.
3. **Attendance:** Every candidate shall have fulfilled the requirement of 80% attendance during each academic year of the postgraduate course (as per MCI rules).

SCHEME OF EXAMINATIONS

The examination shall be held at the end of three academic years (six academic terms). The academic term shall mean six months training period. The examination shall consist of: Theory and Clinical/Practical and Oral.

The examinations shall be organised on the basis of 'Marking system' to evaluate and to certify candidate's level of knowledge, skill and competence.

For passing DM/M.Ch. examination as a whole, a candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory (2) Clinical / Practical and Oral examination.

(1) Theory:

There shall be four theory papers of 3 hours duration and 100 marks each. Out of the four theory papers, one Paper-I shall be on 'Basic Sciences', and another Paper-IV on 'Recent Advances'. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

Paper I and II will be set by one external examiner from outside of the state and paper III and IV by another external examiner from outside of the state. The external examiner, who is paper setter for paper I & II shall evaluate the answer books of paper II. The external examiner, who is paper setter for paper III & IV shall evaluate the answer books of paper III. The answer books of paper I & IV shall be evaluated by internal examiners. The answer books of paper IV shall be evaluated by the Head of the Department and the answer books of paper I shall be evaluated by the second Internal Examiner.

Candidates will be required to attempt all the questions in every question paper. In Paper I, Paper II and Paper III there will be 10 questions. Each question shall carry 10 marks. In Paper IV there will be 5 questions of 20 marks each.

Obtaining a minimum of 40% marks in each theory paper and not less than 50% cumulatively in all the four papers shall be compulsory to pass the examination.

Nomenclature of Theory Papers

Paper-I : Basic Sciences relating to Reproductive medicine and Surgery

Paper-II : Principles of Reproductive Medicine and Laboratory Techniques

Paper-III : Fertility associated Medical and Surgical Diseases, Genetics, Counseling, Ethical and Legal issues related to ART

Paper-IV : Recent advances in Assisted Reproductive Medicine and Surgery

(2) Clinical / Practical and Oral:

Clinical/Practical examination shall be conducted to test / aimed at assessing the knowledge and competence of the candidate for undertaking independent work as a specialist / teacher. Practical examination shall consist of carrying out special investigative techniques for Diagnosis and Therapy. M.Ch candidates shall also be examined in surgical procedures. Oral examination may be comprehensive enough to test the candidate's overall knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the specialty, which shall form a part of the examination. Obtaining of 50% marks in Clinical / Practical and Oral examination shall be mandatory for passing the Clinical / Practical and Oral examination.

a. Clinical Examination

- i. Long case – one [80 Marks]
- ii. Short case – three [3 x 40 = 120 Marks]

Students shall examine a minimum one long case and 03 short cases. The student can take a maximal of 60 minutes for the long case and 30 minutes for each short case. The examiners should also examine the student for the same time period.

b. Practical Examination

- i. Charts (USG, Sperm, Embryos) [30 Marks]
- ii. Specimens (Images) [20 Marks]
- iii. Case Scenarios [20 Marks]
- iv. Instruments (Drugs and disposables) [30 Marks]

c. Oral Examination

[100 Marks]

Oral Examination / Viva voce shall be thorough and shall aim at assessing the student's knowledge and competence about the subject, investigative procedures, therapeutic techniques and other aspects of the specialty, which form a part of the examination.

Total

[400 Marks]

Result:

For passing DM/M.Ch. Examination, a candidate will be required to obtain at least 40% marks in each theory paper, 50% marks in the aggregate of all the four theory papers and 50% marks in the aggregate of Clinical / Practical and Oral examination separately. A candidate failing in any theory paper or in the aggregate of all four theory papers or Clinical / Practical and Oral examination shall have to repeat the whole DM/M.Ch. examination.

Grace Marks

No grace marks will be provided in DM/M.Ch. examinations.

Revaluation / Scrutiny

No Revaluation shall be permitted in the DM/M.Ch. examinations. However, the student can apply for scrutiny of the answer books as per University Rules

Examiners:

As per the Amendment Notification of the MCI dated June 5, 2017, no person shall be appointed as an internal examiner in any subject unless he/she has three years experience as recognized PG teacher in the concerned subject. For external examiners, he/she should have minimum six years of experience as recognized PG teacher in the concerned subject.

For all Post Graduate Super specialties examinations, the minimum number of Examiners shall be four, out of which at least two (50%) shall be External Examiners, who shall be invited from other recognised universities from outside the State.

Number of Candidates:

Only a maximum of 02 students should be examined per day.

Number of Examinations:

The university shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR M.Ch. IN REPRODUCTIVE MEDICINE AND SURGERY (code)

Preamble

Reproductive medicine and surgery is a branch of medicine that deals with prevention, diagnosis and management of reproductive problems. It is founded on the knowledge of reproductive anatomy, physiology, endocrinology and incorporates relevant aspects of molecular biology, biochemistry, pathology, imaging techniques and laboratory methods. Treatment methods include Counseling, Medical, Surgical and Assisted Reproductive Techniques.

Reproductive medicine and surgery also addresses issues of sexual education, puberty, fertility control, reproductive system disease (including sexually transmitted diseases), sexual dysfunction, pregnancy and menopause. This field incorporates and overlaps to some degree with genitourinary medicine, medical endocrinology, pediatric endocrinology, genetics and psychiatry. Specialists in reproductive medicine and surgery are basically qualified obstetricians and gynecologists who have acquired training in reproductive medicine and surgery.

Assisted Reproductive Technology (ART) is a general term referring to methods used to achieve pregnancy by artificial or partially artificial means. The incidence of infertility in the Indian population varies from 10 -15 %. With changing life styles and environmental changes, the incidence of infertility in men and women is on the rise. The need for trained infertility specialists with clear concepts, knowledge and adequate skills is increasing.

There is no structured training programme in this field in India. To get trained in Reproductive Medicine and Surgery, a gynaecologist have to travel far and wide to get knowledge and have to visit different centres to get trained in Fertility enhancing surgeries, Andrology and ART. Hence, there is need for an MCI recognized structured course for M.Ch. in Reproductive Medicine and Surgery

AIM OF THE COURSE:

The aim of the course is to acquire special knowledge in all aspects of reproductive medicine and surgery, to acquire training in clinical, technical, diagnostic, medical, surgical and technological management of infertility, which would help to improve and maintain reproductive health and help people to have children at the time of their choice. This course aims to cater to those gynecologists who would like to serve the increasing infertile population of the country in their day to day practice.

SUBJECT SPECIFIC OBJECTIVES

The students admitted to the course must be exposed to all aspects of Reproductive Medicine and Surgery. The student must learn to perform meticulous history taking, thorough clinical examination, relevant diagnostic tests necessary to decide on the possible cause/s of infertility. After analysing the investigations the student must be able to plan the necessary treatment protocols, counsel the couple regarding the treatment, its success rate, possible complications

and any alternate method of treatment available with pros and cons of each treatment.

When planning the fertility enhancing procedures, necessary preoperative preparation and pre-anaesthetic check up of the patient must be planned by the student. The student would also need to coordinate with other departments to provide patient-focused care. The student should also know the complications and ethical issues involved in ART procedures and counsel the couple appropriately.

All students pursuing M.Ch Reproductive Medicine and Surgery course will follow the following structured teaching programme given below.

A. Clinical Skills

At the end of the course, the student should be able to acquire the following competencies:

1. Demonstrate sufficient understanding of knowledge in Reproductive Medicine and Surgery and allied specialties like Endocrinology, Genetics, Radiology, Urology and Clinical Psychology.
2. Develop the ability to take pertinent history from the patient, perform relevant clinical examination, decide appropriate investigations and plan the treatment schedule.
3. Acquire a reasonable level of theoretical and practical knowledge that empowers him or her to provide the best treatment for the anxious infertile couple and help them have a baby.
4. Acquire proficiency in performing the mandatory procedures independently.
5. Acquire proficiency in Assisted Reproductive Techniques procedures like case based Controlled Ovarian Stimulation, Oocyte retrieval, Embryo transfer techniques, endometrial preparation for FET (Frozen Embryo Transfer) and third party reproduction.
6. Develop into an effective communicator to the patients and their families.
7. Develop essential skills in conducting medical research, and present them in scientific fora and publish in relevant peer-reviewed journals.

B. Teaching skills

The student should be exposed to the basic methodology of teaching and develop competence in teaching medical, paramedical and nursing students at the undergraduate and postgraduate levels. The student must be able to acquire the skills to engage and transfer his/her knowledge in a clear and succinct manner and be able to motivate others. The quality of the information must sustain to the high standards that are required to enhance the understanding of the subject discussed. This should include the ability to actively involve and guide the students in small groups and to provide them with the fundamentals of clinical methods and analytical thinking.

C. Research skills

The student should acquire the basic skills and scientific knowledge to function as independent investigators and for critical evaluation of relevant literature, design experiments and interpret results thereof, communicate the progress of work in formal and informal settings, and understand the modalities of obtaining funds for research from national and international agencies. The students should be exposed to state-of-the-art

basic, translational, and clinical research and through active participation, develop a firm basis for continuing success in one or more of these areas. They should acquire basic knowledge of statistics, along with clinical epidemiologic principles like appropriate study designs, critical appraisal of data management and analysis.

D. Interpersonal and Communication Skills

Through history taking, explaining the need for the investigations and management plan to the couple and counselling, the students would learn and practice communication skills appropriate to each situation. In clinics, they will practice and build a professional relationship with the patients and develop appropriate communication skills so that the infertile couple is provided information about anticipated complications of ART procedures, and the possible outcome. In the operating room setting, they will learn the skill of working with different care givers like surgeons, nurses, technicians and other paramedical staff. The students will learn the importance of working as a team and would develop the required skills for getting the best out of the paramedical and nursing staff. The students would also learn the art of making good presentation in various scientific fora.

E. Ethics and Professionalism

The students would practice professionalism in academic, clinical and research activities and would have primary responsibility for managing cases of infertility in OPD, ward and those posted for surgery, under appropriate supervision. Patients posted for ART must be counselled and appropriate protocol planned for them. Intellectual integrity is emphasised in all settings including the clinics, operating room, conference room, in the conduct of research and publications. Ethical Guidelines of the institute and those published by Governmental agencies like ICMR, MCI should be strictly adhered to.

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive domain (Knowledge domain)

At the end of the first year of the course, the student should acquire the following competencies:

- Basic knowledge of the anatomy of female and male reproductive tract
- Understand the various disease processes that can affect the reproductive tract of both female and male genital tract, resulting in infertility
- Understand reproductive endocrinology pertaining to ovulation, menstruation, spermatogenesis and fertilization
- Acquire knowledge on pharmacokinetics and pharmacodynamics of drugs used in reproductive medicine
- Learn to take a history from infertile couple and their examination.
- Ability to advise the infertile couple appropriate investigations
- Interpret semen analysis
- Interpret endocrine profile of female and male

- Ultrasound imaging for follicular, endometrial development and uterine abnormalities
- Able to perform diagnostic and operative lapro- and hystero-scopic procedures
- Counseling couple on different aspects of infertility treatment
- Organize appropriate treatment depending on the cause of infertility
- Ability to plan protocol for ovulation induction and plan the protocol for patients scheduled for Intrauterine insemination and ART
- Management of imperforate hymen and Mullerian duct agenesis
- Know the different methods of sperm retrieval in patients with azoospermia
- Recommend appropriate investigations for oligozoospermia and azoospermia and formulate appropriate management plan.
- Counsel about sperm banking: pre-oncology treatment and before vasectomy
- Management of OHSS (Ovarian Hyper Stimulation Syndrome)
- Oocyte retrieval and Embryo transfer
- Plan for Frozen embryo replacement and donor–recipient cycle

Second year

At the end of the second year of the course, the student should acquire the following competencies:

- To know the different causes of infertility and their management
- Early pregnancy evaluation and management of recurrent pregnancy loss
- Regulations on Assisted Reproductive Technology (ART)
 - ICMR guidelines, ASRM (American Society of Reproductive Medicine), ESHRE (European Society for Human Reproduction & Embryology) and ASPIRE (Asia Pacific Initiative on Reproduction) Guidelines
- Regulation and ethics in embryology: HFEA (Human Fertilization & Embryology Authority) code of practice
- Adoption, Surrogacy, Third party reproduction – Rules and Regulations
- ART laboratory setting up, maintenance and quality control
- Clinical embryology: ICSI (Intra Cytoplasmic Sperm Injection, IVF (In Vitro Fertilization), IVM (In Vitro Maturation)
- Assessment and grading of oocyte and embryo
- Cryopreservation of oocyte, embryo and semen
- Surgical and medical management of ectopic pregnancy
- Identify patients who need chromosomal and genetic evaluation
- Interpret the results and counsel the patients about consequences of an abnormal report of genetic evaluation
- Plan the management of higher order pregnancy (multiple pregnancy)
- Management of medical diseases associated with infertility

Third Year

At the end of the third year of the course, the student should acquire the following competencies:

- Recent developments in Reproductive Medicine and Surgery
- Provide training to ART staff, telling them the importance of their assigned job
- Training in personnel management, organizational skills, duty rosters etc.

B. Affective domain (Attitude including Communication and Professionalism)

The students will be expected to practice professionalism in the areas of academic, clinical and research activities. With appropriate supervision, they will have primary responsibility for managing cases of Infertility in OPD, Ward and those posted for surgery. Patients planned for ART must be counselled and appropriate protocol planned for them. Intellectual integrity is emphasized in all settings, including in the clinics, operating room, conference room, in the conduction of research and publications. To summarise, the student,

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

At the end of the course, the student should be able to perform independently the following:

First year

- Tubal patency tests : Hysterosalpingogram and saline sonosalpingogram
- Dummy transfer
- Semen analysis
- Preparation of semen sample for intrauterine insemination - different methods.
- Intrauterine insemination (IUI)
- Surgical sperm retrieval : TESE (Testicular Sperm Extraction), TESA (Testicular Sperm Aspiration), PESA (Percutaneous Epididymal Sperm Aspiration)
- Surgical management of miscarriage
- Surgical management of ectopic pregnancy (laparotomy)
- Oocyte retrieval under supervision
- Diagnostic laparoscopy and hysteroscopy
- Ultrasound TAS/TVS (Transabdominal/Transvaginal Sonography): for pelvic anatomy, Ovarian reserve, Follicular monitoring, salinesonohysterogram, Transvaginal cyst aspiration

Second Year

- Minimal laparoscopic surgery: Ovarian drilling, cystectomy
- Hysteroscopic polypectomy, Septal resection and adhesiolysis
- Open Myomectomy
- Treatment of hydrosalpinx
- Embryo transfer
- Oocyte retrieval independently
- Tubal recanalization

Third Year

- Surgical Management of endometriosis
- Laparoscopic Myomectomy
- Laparoscopic Salpingectomy/Salpingostomy for ectopic pregnancy
- Laparoscopic Reversal of sterilisation
- Excision of vaginal septum
- Vaginoplasty
- Hysteroscopic surgery: Resection of Fibroid, Intrauterine synechia
- Difficult Embryo transfer

Syllabus

The outline of the syllabus is given below:

Competencies to be acquired in the Cognitive domain (knowledge):

1. Basic Sciences Relating to Reproductive Medicine and Surgery

- (1) Reproductive tract Anatomy
- (2) Reproductive Physiology and Endocrinology
- (3) Reproductive Pharmacology
- (4) Reproductive Pathology
- (5) Pediatric and Adolescent Gynecology
- (6) Menopause and Premature Menopause

2. Principles of Reproductive Medicine and Laboratory Techniques

- (1) Assisted Reproductive Techniques – Clinical perspective
- (2) Imaging Techniques in Infertility
- (3) Andrology and Applied urology
- (4) Embryology and ART Laboratory
- (5) Early Pregnancy Problems

3. Fertility associated Medical and Surgical Diseases, Genetics, Counseling, Ethical and Legal issues related to ART

- (1) Fertility associated Medical and Surgical Diseases

- (2) Reproductive Genetics
- (3) Ethical and legal issues
- (4) Patient Counseling and Management Skills

4. Recent Advances in Reproductive Medicine and Surgery

DETAILS OF SYLLABUS ARE GIVEN BELOW:

I. Basic Science Relating to Reproductive Medicine and Surgery

1. Reproductive tract anatomy

Objectives : To understand and demonstrate appropriate knowledge, skills and attitudes in relation to anatomy of female and male reproductive tract

Knowledge Criteria

FEMALE:

Uterine anatomy and histology:

- Normal anatomy
- Histology of myometrium
- Different types of congenital abnormalities, their impact on fertility and their management

Endometrial histology:

- Histological appearance of normal and abnormal endometrium
- Developmental stages of the endometrium (dating)
- Endometrial factors that affect implantation in early pregnancy

Tubal anatomy and histology:

- Normal anatomy
- Different types of congenital abnormalities

Vaginal and cervical anatomy and histology:

- Normal anatomy and histology
- Possible consequences of antenatal hormone exposure
- Effects of various hormones on the vagina and cervix

Ovarian anatomy and histology:

- Different compartments of the Graafian follicle (e.g. granulosa cells, theca and adjacent stroma) and the primordial, pre-antral, antral and Graafian follicles, including the dynamic changes which occur in the ovary from embryo to menopause.
- Specific staining techniques and cellular ultrastructure as related to function.
- Gross and microscopic findings and the development of gonadal structures.

Pelvic anatomy, blood, nerve and lymphatic

supply Embryology:

- Development of embryo and abnormalities in development of genital tract
- Embryology of the urological system
- Embryology of hypothalamic–pituitary and other pertinent endocrine systems

MALE:

Male Genital

Organs Penis

- Anatomy and histology, blood, nerve and lymphatic supply

Scrotum

- Anatomy and histology, development, blood, nerve and lymphatic supply

Testes

- Normal anatomy and development of the testis
- Stages of normal spermatogenesis.

Accessory structures

- Normal anatomy and development of epididymis, vas deferens, seminal vesicle and other accessory organs

Clinical Competencies:

- Take history and perform appropriate physical examination to understand anatomy
- Interpret ultrasound report of male and female genital tract
- Discuss the diagnosis of developmental abnormality of genital tract
- Understand normal ovulation and spermatogenesis
- Understand embryogenesis and implantation

Professional Skills and Attitudes:

- Ability to explain to the patient normal reproductive anatomy
- Knowledge and skills to understand the anatomical abnormality in ultrasound report and explain the same to the patient
- Ability to explain the normal process of ovulation and spermatogenesis
- Ability to discuss the normal process of fertilization with the patient
- Ability to counsel patients sensitively about anatomical abnormality
- Ability to formulate management plan related to anatomical abnormality
- Ability to implement plan of management and modify the same, if necessary

2. Reproductive Endocrinology

Objectives

To understand and demonstrate appropriate knowledge, skills and attitudes in relation to female and male reproductive endocrinology.

Knowledge Criteria

FEMALE

Neuroendocrine anatomy and physiology

- Neuroendocrine function: central nervous system, hypothalamic–pituitary system in normal and disease states
- Neuroendocrine regulation of menstrual cycle and ovulation
- Neuroendocrine control of fetus and placenta
- Hypothalamic and pituitary disorders
- Thyroid function and disease states
- Adrenal function and disease states

Disorders of androgen secretion

- Evaluation and management of a hirsute women
- Polycystic ovary syndrome

MALE:

- Endocrine profile of male
- Physiology of Spermatogenesis
- Physiology of ejaculation
- Hypothalamo-pituitary-thyroid axis function

Clinical Competencies:

- To take history and perform an appropriate examination.
- To perform and interpret results of endocrinological tests (Hormone evaluation)
- To discuss the causes of anovulation, such as syndromes of inappropriate prolactin secretion, central nervous system-hypothalamic - pituitary and hypothyroidism
- To plan the evaluation of a patient with hyperandrogenism
- To plan the evaluation of a patient with azoospermia and sexual dysfunction

Professional Skills and Attitudes:

- Ability to explain to the patient the normal reproductive hormones and their functions
- Ability to make the patient understand changes in hormones due to disease processes.
- Ability to explain the need for various tests according to the symptoms and signs
- Skill to interpret hormone assay report and make the patient understand the need for the treatment
- Ability to understand the validity of diagnostic tests, variability and reliability criteria.

3. Reproductive Pharmacology

Objectives

To understand and demonstrate appropriate knowledge, skills and attitudes in relation to drugs used in infertility

Knowledge Criteria

Pharmacokinetics and pharmacodynamics of drugs used in reproductive medicine:

- **Drugs used for ovulation induction:**
 - Anti-estrogens
 - Aromatase inhibitors
 - Gonadotrophin therapy
 - Metformin/insulin sensitisers
- **Drugs used for HRT**
 - Oestrogens
 - Progesterone
 - Aspirin
- Drugs used for Hirsutism
- Drugs used for treatment of endometriosis
- Oral contraceptive pills
- Antibiotics in ART
- Drugs used in treatment of precocious puberty
- Drugs used in treatment of hyperprolactinemia
- GnRH analogues and antagonists
- Steroids and infertility
- Drugs for sexual function

Clinical Competencies:

- To understand the mechanism of action of various drugs used in infertility treatment
- To plan the choice of drugs for various conditions depending on indications and contraindications
- To manage complications of various drugs used in infertility

Professional Skills and Attitudes

- Ability to counsel patient clearly regarding the need for drug administration and its effect on the disease processes.
- Able to explain about alternate treatment options, if available
- Able to explain clearly and openly about the adverse effects of drug treatment and the need for regular follow-up, when on medication.
- Ability to recognise the adverse effects of the drug and able to manage it

4. Reproductive Pathology

Objectives

To understand and demonstrate appropriate knowledge, skills and attitudes in relation to pathological conditions in female and male reproductive tract

Knowledge Criteria

FEMALE:

Uterine pathology:

- Impact of intrauterine adhesions
- Impact of fibroids and adenomyosis
- Current data relating estrogens with endometrial hyperplasia and adenocarcinoma
- Acute and chronic endometritis
- Gross and microscopic findings of endometriosis
- Gross and microscopic findings of adenomyosis, leiomyoma and other myometrial lesions related to reproduction
- Relationships of leiomyoma to infertility, including each of the different types (e.g. subserosal, intramural and submucosal)

Tubal pathology:

Gross and microscopic findings of diseases of the oviduct (e.g. acute and chronic salpingitis, granulomatous salpingitis, endometriosis)

Tubal factors of infertility:

- Natural history and clinical course of acute and chronic salpingitis and relate these to subsequent fertility
- Hydrosalpinx – etiology and management

Ovarian pathology:

- Ovarian cyst and tumours
- Gross and microscopic findings and natural history of ovarian tumours related to reproductive function (e.g. follicular cysts, luteoma, corpus luteum, polycystic ovary Syndrome, endometrioma, granulosa-theca cell tumour, Sertoli-Leydig cell tumour, gynandroblastoma, cystic teratoma, dysgerminoma, gonadoblastoma and mixed germ cell or gonadal tumours)

PELVIC INFLAMMATORY DISEASE (PID)

Pelvic Tuberculosis

Paraovarian cyst

Endometriosis

- Pathogenesis and aetiology of endometriosis
- Symptoms
- Mechanisms by which minimal and mild endometriosis may impair fertility.
- Investigations: Ultrasound/computed tomography/magnetic resonance imaging.
- Effects on fertility
- Disturbances in the peritoneal fluid environment
- Diagnosis, staging / grading of disease and prognosis

- Place of expectant management, medical and surgical treatment in the management of endometriosis
- Role, possible benefits and potential adverse effects of pharmacological agents, e.g. Oral Contraceptives, progestogens, danazol, gestrinone, Gonadotrophin Releasing Hormone (GnRH) analogues, in the management of endometriosis
- Role of assisted reproduction in the management of endometriosis.
- Pain management

MALE:

- Gross and microscopic findings in testicular disease (e.g. teratoma, seminoma, Leydig and Sertoli cell tumours)
- Diseases of accessory organs – seminal vesicle and epididymis
- Absence of vas deferens – diagnosis and management
- Testicular biopsy - its interpretation
- Varicocele – Aetiology, diagnosis, symptoms, grading and management.
- Infections of male genital organs

Clinical Competencies:

- To differentiate different types of uterine anomalies, their impact on fertility and management
- To diagnose and plan the management of intra-uterine adhesions
- To know the natural history, pathological changes, clinical course of acute and chronic Salpingitis and relate these to subsequent fertility
- Vaginal and cervical anatomy and histology: effect of various hormones
- Endometriosis and its effects on fertility
- Aetiology of PID and its effect on fertility
- Diagnostic features of adenomyoma and fibroid uterus
- Diagnosis of different types of ovarian tumours /cysts
- Interpretation of the testicular biopsy report
- Diagnose the absence of vas and formulate plan of management
- Diagnose and manage male genital organ infections

Professional Skills and Attitudes

- Ability to counsel patient regarding the disease processes and its effect on reproductive health
- Ability to respect patients' confidentiality regarding the disease process
- Ability to formulate and implement plan of management and discuss it with the patient
- Ability to counsel patients sensitively about the treatment options available for the disease
- Ability to explain clearly and openly about complications of the various treatments that are available for the disease

5. Reproductive Immunology

Objectives

To understand and demonstrate appropriate knowledge, skills and attitudes in relation to immunological aspects and failures of female and male reproductive system

Knowledge Criteria

Female:

- Immunology of pregnancy
- Allo- and auto- immunological failures
- Repeated pregnancy loss and implantation failure

Male:

- Immunological reproductive failure in men/sperm antibodies

6. Pediatric and Adolescent Gynaecology

Objectives

To understand and demonstrate appropriate knowledge, skills and attitudes in pediatric and adolescent gynecological problems

Knowledge Criteria

Development of gonads

- Factors controlling development of the gonadal primordia, internal duct system and external genitalia in male and female, Normal sequence of pubertal changes in the female and male and their chronology
- Hormonal changes and gametogenesis relative to the reproductive cycle: from intrauterine life to the development of normal reproductive cycles (e.g., gonadotrophin secretion in the fetus and the neonate, sensitivity of the feedback system during fetal and neonatal life and childhood; role of adrenal androgens).
- Delayed puberty including differential diagnosis, evaluation and appropriate therapy
- Developmental abnormalities of the genital tract including ambiguous genitalia, imperforate hymen and vaginal septa
- Uterine anomalies: Müllerian and Wolffian dysgenesis
- Rokitansky syndrome
- Gonadal dysgenesis
- Effects of hormones on bone growth and epiphyseal closure
- Sexual precocity including differential diagnosis, evaluation and appropriate therapy.
- Ambiguous genitalia: Differential diagnosis and its evaluation
- Involvement in the assignment of sex of rearing of infant with ambiguous genitalia,
- Techniques for surgical reconstruction (e.g. vaginoplasty, clitoridectomy and clitoral resection)
- Indications and techniques for gonadectomy
- Delayed puberty and primary amenorrhea

- Androgen insensitivity syndrome
- Congenital Adrenal hyperplasia.

Clinical Competencies:

- Take history and perform appropriate clinical examination.
- Organise appropriate endocrine investigation of disordered ovulation.
- Select and manage appropriate treatment for PCOS.
- Management of hyperandrogenism and ambiguous genitalia

Professional Skills and Attitudes:

- Ability to counsel patient and their parents about changes in reproductive organs during adolescence
- Educate the patient regarding menstrual cycle, ovulation and its disturbances
- Educate the patient and their parents regarding precocious puberty and the need to treat it
- Ability to understand and advise steps to prevent long term health consequences in PCOS
- Ability to counsel patient regarding assigning of sex in cases of ambiguous genitalia
- Ability to educate patient regarding developmental genital tract anomalies and their effects on reproduction

7. Menopause and premature Menopause

Objectives: To understand and demonstrate appropriate knowledge, skills and attitudes in menopause and premenopausal problems

Knowledge Criteria

Predictors of Ovarian reserve

Premature menopause:

- Causes of premature ovarian failure: congenital endocrine disorders (e.g. Turner Syndrome, complete androgen insensitivity syndrome, ovarian agenesis, polyglandular endocrinopathy and Fragile X syndrome) and acquired disorders (post-surgery, chemo/radiotherapy)
- Management of the post-menopausal woman
- Interpretation of tests used to evaluate amenorrhoea
- A rational diagnostic and therapeutic approach to patients with amenorrhoea
- Choice of hormone replacement therapy (HRT)
- Advantages and disadvantages, risks and benefits of HRT
- Treatment options for young women with ovarian failure, with particular regard to future fertility

Clinical Competencies:

- A rational diagnostic and therapeutic approach to patients with amenorrhea.
- Liaison with fertility services.
- To plan immunological investigations when required

- Interpretation of dual-energy X-ray absorptiometry bone scans.
- To plan HRT explaining the risks involved and advise appropriate follow up
- Plan for donor oocyte program

Professional Skills and Attitudes

- Ability to counsel patients regarding hormonal changes in menopause and premature menopause
- Ability to analyse and discuss with patients the results of ovarian reserve testing
- To counsel patient with ovarian failure and treatment options available to have a baby
- Ability to counsel patients with ovarian failure regarding the need for HRT.
- Ability to explain clearly and openly about the adverse effects of HRT and the need for follow up when the patient is on HRT.

II. Principles of Reproductive Medicine and Laboratory Techniques

1. Assisted Reproductive Techniques - Clinical perspectives

Objectives

To demonstrate knowledge and competency in relation to patients requiring ovulation induction and assisted conception

Knowledge Criteria

Normal ranges in:

- semen parameters
- endocrine profile: female and male

Ovulation induction

- anti-estrogens and aromatase inhibitors
- gonadotrophin

Hyperprolactinemia

Stimulation Protocols:

- Long Gonadotrophin-Releasing Hormone (GnRH) protocol
- Short GnRH protocol
- Ultra Short and microflare protocol
 - Stop protocol
 - Newer protocols
- GnRH antagonist cycles
- In vitro Fertilisation (IVF).
- Intra cytoplasmic sperm injection (ICSI)
- Frozen embryo replacement:
- Natural cycle

- HRT cycle
- Luteal support
- Donor–recipient cycle
- Donation of Oocyte and Sperm
- Screening of potential egg donors
- Surrogacy
- Egg sharing
- Cryo preservation of gamete, embryo, tissue.
- In Vitro oocyte maturation
- Management of complications including Ovarian Hyper Stimulation Syndrome.

Clinical Competencies:

- Take history of infertile couple.
- Examination of infertile couple:
- Arrange investigations
- Interpret semen analysis
- Interpret endocrine profile: female and male
- Organise and counsel appropriate treatment to infertile couple
- Ovulation induction: anti-estrogens, gonadotrophins
- Intrauterine insemination
- Plan protocol for patients scheduled for ART
- Plan for Frozen embryo replacement and Donor–recipient cycle
- Ultrasound/Imaging for Follicular, Endometrial development, Uterine abnormalities
- Ovarian pathology
- Oocyte retrieval and Embryo replacement
- Know the different methods of sperm retrieval in patients with azoospermia
- Counsel couple on different aspects of infertility treatment
- Critical awareness of the limitations of investigative procedures

Professional Skills and Attitudes

- Ability to explain clearly the probable cause of infertility and plan treatment for the couple
- Ability to counsel patients regarding the ART procedures available
- To explain in detail about the complications of ART
- Ability to understand the limitations of the ART procedures
- To make the patient understand the adverse effects of drugs used for controlled ovarian stimulation

2. Imaging Techniques in Infertility

Objective

To demonstrate the knowledge, skills and attitudes relating all aspects of imaging techniques in male and female infertility evaluation.

Knowledge Criteria

- Uterine and tubal imaging
- Hysterosalpingography
- Hysterosalpingo-contrast-sonography
- Saline sonosalpingohysterogram
- Computed tomography (CT) / magnetic resonance imaging (MRI)

Evaluation of pituitary fossa: X-ray skull, MRI and

CT Ultrasound imaging: Abdominal and TVS:

- Follicular tracking: natural / simulated cycles
- Tracking IVF endometrial development
- Uterine abnormalities eg: fibroids, adenomyosis, anomalies
- Endometrial assessment, including normal cyclical changes, changes associated with hormone replacement, hyperplasia and malignancy
- Ovarian pathology
- Early pregnancy assessment
- Oocyte retrieval

Ovarian and uterine Doppler in

Infertility Selective Fetal reduction

Clinical Competencies

- Hysterosalpingography
- Contrast sonohysterosalpingogram
- Reading CT/MRI
 - Ultra Sonography
 - Follicular tracking: natural / stimulated cycles
 - Tracking IVF endometrial development
 - Uterine abnormalities eg: fibroids, adenomyosis
 - Endometrial assessment, including normal cyclical changes, changes associated with hormone replacement, hyperplasia and malignancy
 - Ovarian pathology
 - Early pregnancy assessment
 - Oocyte retrieval

Professional Skills and Attitudes

- Ability to counsel patient about the need for various diagnostic imaging procedures
- Ability to describe the limitations of various diagnostic imaging procedures
- Ability to distinguish the use of different modalities of ultrasonography and Doppler
- Ability to perform abdominal and transvaginal ultrasonography and to interpret findings of ultrasonography and explain it to the patient
- Ability to perform follicular monitoring and identify the signs of ovulation and advice

- the patient regarding fertile period
- Ability to perform, interpret and explain to the patient the report of early pregnancy scan or differential diagnosis of early pregnancy loss / abnormal pregnancy.

3. Andrology and Applied Urology

Objectives

To demonstrate knowledge and competency in relation to men with fertility problems.

Knowledge Criteria

- Appropriate history and investigations
- Assessing sperm function
- Intrauterine insemination
- Investigation of male infertility
- Assessment and management of Erectile dysfunction
- Ejaculatory dysfunction
- Varicocele
- Reconstructive andrology

Methods of sperm retrieval

- Microsurgical epididymal sperm aspiration
- Percutaneous epididymal sperm aspiration
- TESA/TESE
- Open testicular biopsy

Medical treatment of male infertility:

- Antioxidant therapy
- Aromatase therapy
- Anti - estrogens
- Endocrine therapy
- Effect of aging on sperm function
- Genetic causes for male infertility

Sperm banking:

- Counsel about sperm banking, pre-oncology treatment and before vasectomy - Indian Council of Medical Research (ICMR) – ART GUIDELINES
- HEFA Code of practice

Clinical Competencies:

- Take appropriate history of a subfertile male:
- Examination of subfertile male

- Arrange investigations
- Interpret semen analysis
- Interpret endocrine profile: male
- Investigation of male infertility
- Form appropriate management plan.
- Counsel about sperm banking: prior-oncology treatment
- Treatment:
 - Endocrine therapy
 - Gonadotrophin therapy
 - Sexual Dysfunction-Evaluation and management
 - Reconstructive Surgery in male reproductive failure

Professional Skills and Attitudes

- Ability to evaluate semen analysis and hormonal assay reports
- Ability to counsel the couple about the disease process/es in the male partner which could be the cause of infertility.
- Ability to formulate plan of treatment related to pathological findings and discuss it with the couple
- Ability to explain the necessary drug treatment/s and its complication
- Counseling the couple regarding sexual dysfunction and its appropriate management
- Ability to choose between ART vs Surgical management in male factor infertility (varicocelectomy, reconstructive surgery)

4. Embryology and ART laboratory

Objective

To demonstrate the knowledge, skills and attitudes relating all aspects of Embryology and ART laboratory

Knowledge

Criteria Clinical

Embryology

- Cell biology
- History and overview of ART
- Instruments used in IVF

Introduction to embryology

- Fertilization and Embryo development
- Control of early follicular development
- Control of terminal follicular development
- Oocyte maturation – *In vivo*
- IVM
- Gamete transport

- Implantation
- Endocrinology of implantation
- Molecular basis of fertilization
- Gene expression in early embryos
- Epigenetic events in early embryos

ART laboratory

- Maintenance of ART lab
- Media for ART procedures
- Semen preparation techniques
- Collection and culture of oocytes and embryos
- Grading of oocytes and embryos
- IVF and ICSI, TESE
- IVM
- Embryo transfer techniques
- Cryopreservation of embryo, gametes, tissue
- Assisted hatching

Regulation and Ethics in Embryology

- ART and law
- Semen banks and donor sperms
- Ethics – case studies
- Counseling

Clinical Competencies:

- Embryology lab setup and maintenance of equipments
- Culture media selection
- Semen preparation methods
- Methods of fertilization
- Culture methods
- Grading of the oocyte and embryo
- Cryopreservation techniques
- Embryo transfer
- Semen bank
- Ethics in embryology

Professional Skills and Attitude:

- Ability to respect patient's confidentiality regarding the chosen ART procedure
- Ability to explain clearly and openly about different techniques of fertilization in ART
- Ability to formulate line of treatment and choose the method appropriate for the couple
- Ability to liaise effectively with colleagues in other disciplines, clinical and non-

- clinical (e.g. andrologists, endocrinologists, IVF centre team and urologists).
- Ability to describe limitations of the ART procedures.
- Ability to understand the oocyte and embryo morphology
- Ability to set up, maintain and supervise the Lab
- Trouble shooting in the Lab
- Quality control of Lab

5. Early Pregnancy Problems

Objective: To demonstrate the knowledge skills and attitudes related to early pregnancy and its complications

Knowledge Criteria Ectopic pregnancy:

- Causes
- Investigations
- Medical management
- Surgical management

Miscarriage:

- Causes
- Investigations
- Medical management
- Surgical management

Molar pregnancy

Multiple pregnancy

Clinical Competencies:

Recurrent miscarriage:

- Take history:
 - Pregnancy history
 - Medical history
- Organise appropriate investigations
- Interpret endocrine assessment
- Interpret immunological assessment
- Formulate management plan
- Liaise with colleagues in other disciplines.

Molar pregnancy

Counsel about:

- Causes of miscarriage
- Treatment options

- Implications following molar pregnancy.

Manage clinical conditions:

- Antiphospholipid syndrome
- Uterine abnormalities.

Emergency gynaecology:

- History and examination
- Organise appropriate investigations
- Interpret endocrine assessment
- Formulate management plan

Clinical Competencies:

- USG confirmation of intrauterine gestational sac with embryo, yolk sac, cardiac pulsation and assessment of gestational age.
- Diagnose ectopic pregnancy and heterotopic pregnancy
- Surgical and medical management of ectopic pregnancy
- Medical and surgical management of miscarriage
- Plan the management of multiple pregnancy

Professional Skills and Attitudes:

- Ability to explain the problems of early pregnancy and to emphasize the need for early pregnancy scan.
- Ability to discuss the management options and the risk of complications associated with higher order multiple pregnancy, with the patient.
- Ability to discuss causes of miscarriage and therapeutic options

III. Fertility associated Medical and Surgical Diseases, Genetics, Counseling, Legal and Ethical issues related to ART

1. Fertility associated Medical and Surgical Diseases

Objectives

To achieve skills appropriate for a subspecialist in managing Medical and Surgical diseases related to Infertility.

Knowledge Criteria

- Anatomical systems in relation to human reproduction.
- Medical diseases associated with fertility.
- Basics of surgery (laparotomy)
- Basics of laparoscopy
- Basics of hysteroscopy
- Role of endoscopic and open surgery in the treatment of fertility-related conditions
- Indications for diagnostic and operative laparoscopy

- Indications for diagnostic and operative hysteroscopy
- Complications of endoscopy & open surgery
- Tubal Recanalization – laparoscopic and open surgery method
- Principles of microsurgery
- Post operative adhesion preventive measures
- Role of fertility enhancing surgery in men
- Role of reconstructive microsurgery surgery for male infertility
- Varicocelectomy– diagnosis, indications and complications
- Methods of surgical sperm retrieval
- Surgical management of ectopic pregnancy

Clinical Competency

Laparoscopic surgery:

- Diagnostic laparoscopy
- Treatment of minimal/mild endometriosis
- Treatment of ovarian endometrioma
- Treatment of ovarian dermoid
- Division of adhesions
- Salpingectomy for hydrosalpinx
- Salpingostomy for hydrosalpinx
- Salpingectomy for ectopic pregnancy
- Salpingostomy for ectopic pregnancy
- Laparoscopic myomectomy
- Ovarian diathermy.

Hysteroscopic surgery:

- Diagnostic hysteroscopy
- Outpatient hysteroscopy
- Resection of fibroid
- Resection of polyp
- Division of septum
- Division of adhesions
- Proximal tubal cannulation

Open fertility surgery:

- Reversal of sterilisation
- Myomectomy
- Excision of vaginal septum
- Imperforate hymen
- Excision of rudimentary horn of uterus
- Hysterectomy for severe endometriosis.
- Reversal of vasectomy
- Vasectomy

- Ligation of varicocele
- Percutaneous epididymal sperm aspiration
- Open testicular biopsy
- Testicular Sperm Aspiration

Surgery in Male:

- Ligation of varicocele
- Sperm retrieval techniques : PESA, MESA, FNAC of testis (TESA) and Open Testicular biopsy (TESE)

Professional Skills and Attitudes

Ability to diagnose the medical disease associated with infertility and plan appropriate treatment. Ability to choose the correct surgical procedure for the disease process and explain it in detail to the patient

Ability to explain clearly and openly about the complications of the surgery. To counsel the patient about reproductive performance after the surgery Ability to plan the correct method of surgical sperm retrieval

Able to choose between reversal of sterilization and ART procedures for patients and counsel them appropriately

2 Reproductive Genetics:

Objective: To demonstrate the knowledge, skills and attitudes relating to Reproductive Genetics

Knowledge Criteria

- Genetic history and counseling
- Cell cycle and biology
- Approach to chromosome analysis
- International System for Human Cytogenetic Nomenclature

Normal variation:

- Banding techniques
- Prenatal diagnosis
- Cell culture and processing
- Preimplantation genetic diagnosis
- Preimplantation genetic screening

Basis of genetic inheritance and transmission of genetic disease:

- Single gene disorders: recessive and dominant
- Sex-linked disorders
- Late-onset disorders and disease susceptibilities

- Chromosome rearrangements: Robertsonian reciprocal translocations and their consequences
- Aneuploidy, sporadic aneuploidy and important aneuploidy syndromes (e.g. Edwards, Turner, Patau).

Tools for genetic diagnosis

- Cytogenetics
- Molecular cytogenetics: Principles and application

Clinical Competencies:

- Genetic history and counseling
- Cell cycle and biology
- Approach to chromosome analysis
- International System for Human Cytogenetic Nomenclature
- Normal variation
- Banding techniques
- Prenatal diagnosis
- Cell culture and processing
- Preimplantation genetic diagnosis and screening

Professional Skills and Attitudes

- Ability to counsel patients regarding genetic causes of infertility
- Ability to plan chromosomal and genetic studies in an infertile couple when indicated and explain it to the couple
- To interpret the results and counsel the patient about consequences of abnormal report
- Clinical awareness of the limitations of chromosomal and genetic studies in the evaluation of infertility
- Use of Preimplantation Genetic Screening (PGS) and preimplantation genetic diagnosis (PGD) procedure in patients undergoing ART

3 Ethical and legal issues

Objectives

To demonstrate knowledge of various Guidelines in ART

Knowledge

Regulations of Assisted Reproductive Technology

ICMR guidelines in ART

1. Staff
2. Facilities

3. Assessing Clients, Donors and Welfare of the Child
 - Confidentiality
 - Assessment of potential gamete donors
4. Information
5. Consent
6. Use of gametes and embryos
7. Storage and handling of gametes and embryos
8. Third party reproduction: rules & guidelines
9. Cross border reproduction: problems and guidelines
10. Adoption Guidelines

Clinical Competencies:

- Guidelines in ART – ICMR, ASRM, ESHRE and guidelines of other fertility societies
- Consent taking and importance of documentation
- Adoption procedure
- Third party reproduction- ethical and legal issues
- Guidelines on the number of embryos to be transferred
- Posthumous reproduction - ethics and legal issues
- Storage and use of frozen gametes and embryos

Professional Skills and Attitudes:

- Ability to counsel and take consent for ART procedure as per the guidelines
- Ability to explain the ethical and legal issues in third party reproduction
- Ability to discuss the success rate and the cost involved in ART and to document it
- To discuss the complications of ART and to document it in the case sheet
- Maintenance of the IVF unit record as per guidelines
- Ability to discuss the adoption guidelines and guide them to appropriate centers

4. Patient Counseling and Management Skills

Skills: the trainee would be expected to acquire skills in the following domains:

A) ACADEMIC SKILLS:

i. Teaching

- Formal training in teaching methodologies.
- Experience in undergraduate and postgraduate teaching, including working in different teaching media (lecture, seminar, interactive tutorial).
- Experience and willingness to undertake undergraduate and postgraduate medical teaching and nurse education.
- Development of teaching materials and organization of teaching courses.
- Involvement in the audit processes.

ii. Continued personal development:

- Computer literacy and familiarity with commonly used systems.
- Critical approach to information gained from literature review and audit.
- Preparation of manuscripts and teaching materials.
- Oral presentation skills.
- Time management skills.
- “Reflective practice” skills – learning and creating knowledge by personal reflection.

iii. Research

- Innovative approach to clinical problems.
- Willingness to assess evidence of which to base practice.
- Understanding of research methodology, including the randomized controlled trial.
- Attendance at research orientated national meetings.
- To have undertaken a defined piece of academic research, which has led to publication in a peer reviewed journal.

B) MANAGEMENT SKILLS

The trainee would be expected to have received training or experience in the following areas and to have been involved as a participant in the management Unit

i. Personnel:

- Training in personnel management.
- Organizational skills, duty rosters etc.
- Awareness of current medical manpower regulations and nurse staffing issues.
- Understanding of the role of counselors and art nurses.

ii. Audit:

- Data capture and collation, including national and local statistics and preparation of annual reports.
- Assessment of performance; benchmarking.
- Risk management and clinical governance.
- Assessment of equipment and resource.

iii. Financial – training in:

- Budgetary management.
- Setting of contracts.
- Assessment of performance.

iv. Wider strategic issues - awareness of:

- Provider and purchaser communication.
- Service development strategy.
- National representation and professional development.

v. COUNSELING AND COMMUNICATION SKILLS

- Information counseling
- Implication counseling
- Support counseling
- Therapeutic counseling

Clinical Competency

- Counseling the couple
- Communication with patients and relatives
- Management skills of IVF Unit

Professional Skills And Attitudes

- Ability to respect patients confidentiality and discuss issues with both partners separately
- Ability to communicate with the counselor
- Ability to liaise effectively with professionals
- Quality Control of the IVF Unit
- Organization of work elements in the ART unit

IV. Recent Advances in Reproductive Medicine and Surgery

TEACHING AND LEARNING METHODS

PG students and attending physicians must participate in the teaching programs as follows:

1. Journal Club:

The trainee will present a journal article relevant to Reproductive Medicine and Surgery either an original article (Randomized Controlled Trial/Systematic review) or a short study along with a review article. The trainee is expected to present the article citing the relevance, background/context, study methods and statistical analysis, interpret results and discussion, summarize present limitation and critically analyse the study methods and outcomes. The trainee should select good articles related to ART, endoscopy, ultrasound, fetal medicine and endocrinology from various journals both national and international.

2. Didactic Lectures:

Invited didactic lectures on Reproductive Medicine and Surgery, biostatistics, research methodology, teaching methodology, from external faculty of specialties related to the subject, medical ethics and legal issues related to Assisted Reproduction should be conducted.

3. Subject Seminar:

The trainee will present a subject topic allocated after doing a comprehensive preparation, relevant literature search and present the topic in detail covering all relevant aspects,

clinical applications and engage audience and answers questions.

4. Hospital Grand Rounds:

The trainee will attend the Grand Rounds whenever scheduled which involves presentation of cases by postgraduates, discussion on the required investigations and the options for management.

5. Clinical Case Presentation and case reviews:

- Trainee will present an infertility case after taking a detailed history and thorough physical examination, formulate diagnosis and differential diagnosis and able to plan a comprehensive care plan for the patient.
- To review the COS case files and to plan further treatment to suit the patient.

The teaching schedule can be planned by the teaching institute.

6. Core Training:

Both learning and teaching should be integral part of the programme. The chain of learning from peers and teaching the juniors should never be broken.

- Case discussions and hands on teaching in the operating theatre should be the mainstay of the teaching programme, rather than only didactic lectures.
- Journal Club meetings should be held regularly
- Morbidity and Mortality (if any) review and departmental audit should be held monthly to review all deaths and complications attributed to the treatment.
- Unscheduled and informal discussions to be held as often as possible depending upon the variety and the number of procedures seen. This method could be an excellent teaching tool rather than totally regimented scheduling at this level of education.
- The students should be encouraged to undertake epidemiological and /or clinical research programme on selected topic. They should be taught the basic methods of research and reporting.
- The post graduate student should have a minimum of one publication in indexed international journals and National journals and two paper presentations and one poster presentation at National or state level infertility or appropriate conferences.
- The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- Department should encourage e-learning activities.

7. Additional teaching/training

All postgraduate trainees must attend regular CMEs, Conferences, Workshops, small group teaching organized by local/national/international institutes and must be abreast with the current knowledge and recent advances in the field of Reproductive Medicine and Surgery.

8. Log book

Logbooks serve as a document of the trainee's work. The trainee shall maintain in Logbook the special procedures/ operations performed by him / her during the training period right from the point of entry and its authenticity shall be regularly assessed by the faculty and certified by the concerned Postgraduate Teacher / Head of the Department. This shall be made available to the Board of Examiners for their perusal at the time of his

/ her appearing at the final Exit Examination. The logbook should record cases seen and presented, procedures performed, seminars, journal club and other (case) presentations. Logbook entries must be qualitative and not merely quantitative, focusing on learning points and recent advances in the area and must include short review of recent literature relevant to the case. It should also contain detailed documentation of a minimum of 10 interesting cases.

9. Research

A student shall be required to present at least one paper and one poster at conferences of state, national or international levels. The work has also to be published or at least sent for publication in an Indexed journal (as per MCI Guidelines) before the completion of course.

Posting in Allied Departments

A student should be posted to various allied departments like Anatomy, Endocrinology, Urology, Radiology and foetal medicine, clinical psychology and Genetics to acquire more knowledge. He or she should attend lectures arranged by the Biostatistics and Epidemiology departments from time to time.

Learning objectives of the rotation postings to the allied departments, are as under:

1. Department of Endocrinology

- Neuroendocrine function: central nervous system, hypothalamic–pituitary system and disease states
- Neuroendocrine regulation of the menstrual cycle and ovulation
- Hypothalamic and pituitary disorders
- Thyroid function and disease states
- Adrenal function and disease states
- Disorders of androgen secretion
- Evaluation and management of a hirsute women
- Hormonal control of spermatogenesis
- Endocrine profile of male.
- Evaluation and management of male hypogonadism

2. Department of Radiology and Fetal Medicine

- Computed tomography (CT) / magnetic resonance imaging (MRI) in Infertility
- Evaluation of pituitary fossa: X-ray skull, MRI and CT

- Abdominal and Renal ultrasound
- Imaging for Uterine abnormalities eg: fibroids, adenomyosis, anomalies
- Scrotal ultrasound and Doppler
- TRUS (Transrectal Ultrasonography)
- Penile Doppler studies
- Early pregnancy assessment – normal and abnormal
- Ovarian and uterine Doppler in Infertility
- Selective Fetal reduction, Amniocentesis

3. Department of Genetics

Practical aspects in

genetics

- Gene structure, function and gene mutation
- Approach to chromosome analysis and anomalies International System for Human Cytogenetic Nomenclature
- Banding techniques
- Cell culture and processing
- Tools for genetic diagnosis
- Cytogenetics and Molecular cytogenetics: Principles and application
- Genetic history and counselling
- Genetics in clinical practice
- Gene structure, function and gene mutation
- Cell cycle and biology
- Patterns of inheritance
- Non –Mendelian inheritance
- Approach to chromosome analysis and anomalies International System for Human Cytogenetic Nomenclature
- Normal variation:
- Banding techniques
- Prenatal diagnosis
- Cell culture and processing
- Preimplantation genetic diagnosis
- Preimplantation genetic screening

Basis of genetic inheritance and transmission of genetic disease:

- Single gene disorders: recessive and dominant
- Sex-linked disorders
- Late-onset disorders and disease susceptibilities
- Chromosome rearrangements: Robertsonian reciprocal translocations and \ their consequences
- Aneuploidy, sporadic aneuploidy and important aneuploidy syndromes (e.g. Edwards, Turner, Patau).
- Cytogenetics

Molecular cytogenetics: Principles and application

4. Department of Urology

- Evaluation and management of male infertility
- Sexual dysfunction evaluation and management
- Varicocele: diagnosis and management
- Sperm retrieval techniques
- Microsurgical techniques for obstructive azoospermia

5. Department of Clinical Psychology

- Stress management
- How to cope up with stress
- Body mind relationship
- Infertility counselling
- Family support
- Knowledge and attitude of patients towards infertility
- Anxiety and depression
- Financial stress and support

6. Department of Anatomy

- Observation of Pelvic dissection pertaining to pelvis, reproductive organs both male and female
- Histology of structures of the reproductive system

Training timeline during three years of PG training in parent institute and outstation institutes

The training programme should aim to provide sound knowledge in the field of Reproductive Medicine and Surgery. It will provide additional exposure to the student in the allied departments like Endocrinology, Anatomy, Urology etc. It is desirable that the student should also receive an opportunity during the training period to spend a period of up to 4 weeks in other similar advanced centers for enriching his or her experience.

The recommended duration for which the student will be posted in various departments during the 3 year training program

- | | |
|---|-------------|
| • Reproductive Medicine and Surgery | : 120 weeks |
| • ART Laboratory (4 weeks each year) | : 12 weeks |
| • Imaging (Fetal Medicine / Radiology) | : 2 weeks |
| • Urology / Andrology (4 weeks each department) | : 8 weeks |
| • Endocrinology | : 4 weeks |
| • Genetics | : 2 weeks |
| • Anatomy | : 2 weeks |
| • Clinical Psychology (Counseling) | : 2 weeks |
| • Outside Centre | : 4 weeks |

During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of surgical skills laboratories in the medical colleges is mandatory.

ASSESSMENT

Assessment should be comprehensive & objective. It should address the stated competencies of the course. The assessment needs to be spread over the duration of the course.

FORMATIVE ASSESSMENT, i.e., assessment during the training would include:

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. Internal Assessment should be conducted in theory and clinical examination.

Quarterly assessment during the MCh training should be based on following educational activities:

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

Clinical skills and performance, academic performance and personal attributes shall be graded on a scale of 1 to 5 (5 being the highest). The academic presentations shall be graded at the time of presentation by the consultant in-charge. Evaluation on clinical skills and personal attributes shall be done by the Head of the department at the end of every year.

The theory examinations shall be held well in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the Clinical/Practical and Oral examination.

Summative assessment, at the end of the course, Post Graduate Examination

The summative examination would be carried out as per the Rules given in POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.

The summative assessment examination shall include two heads:

- A. Theory examination.
- B. Practical, Clinical examination and Viva-voce.

Theory examination and Practical/Clinical, Viva-voce shall be separate heads of passing. Theory examination shall comprise of four papers. Passing percentage shall be cumulatively 50% with minimum of 40% marks in each theory paper.

Practical /Clinical examination consisting of at least one long case, three short cases and viva-voce. Passing percentage shall be 50%.

Passing shall be separate for each head and failing shall be common, meaning thereby that clearance at theory and failure at practical / clinical shall amount to failure at Summative examination and vice versa.

A. THEORY EXAMINATION

The M.Ch. examination shall be in two parts:

1. Theory: There shall be four theory papers as follows:

PAPER	TITLE
I	Basic Sciences relating to Reproductive medicine and Surgery
II	Principles of Reproductive Medicine and Laboratory Techniques
III	Fertility associated Medical and Surgical Diseases, Genetics, Counseling, Ethical and Legal issues related to ART
IV	Recent advances in Assisted Reproductive Medicine and Surgery

1. Practical/Clinical and Oral

Examination: Clinical Examination:

- a. Long case - one
- b. Short case - three

Students shall examine a minimum one long case and 03 short cases. The student can take a maximal of 60 minutes for the long case and 30 minutes for each short case. The examiners should also examine the student for the same time period. Only a maximum of 02 students should be examined per day.

Practical Examination:

- a. Charts (USG, Sperm, Embryos)
- b. Specimens (Images)
- c. Case Scenarios
- d. Instruments (Drugs and disposables)

Oral Examination

Oral Examination/Viva voce shall be thorough and shall aim at assessing the student's knowledge and competence about the subject, investigative procedures, therapeutic techniques and other aspects of the specialty, which form a part of the examination.

Recommended reading Books (latest edition)

- (1) Text book of Assisted Reproductive Techniques- Laboratory and Clinical Perspectives by David K. Gardner
- (2) Text book of In vitro Fertilisation and Assisted reproduction by Peter. R. Brinsden
- (3) The Bourn Hall Guide to Clinical and Laboratory practice
- (5) Infertility in Practice by Adam H Balen
- (6) Diagnosis and management of ovarian disorders by Albert Attchek, Liane Deligdisch, Nathen G Kase
- (7) Hysterosalpingography A Text book and Atlas by – David. J. Ott
- (8) The Ovary – Leung and Adashi
- (9) Infertility Male and Female – by Insler
- (10) Ultrasonography in Obstetrics and Gynaecology --- Callen
- (11) Campbell's Urology
- (12) Novak's Text book of Gynaecology
- (11) Telinde's Operative Gynaecology
- (12) Speroff's Book of Gynaecologic Endocrinology and Infertility
- (13) William's text boot book of Obstetrics
- (14) Bonney's Gynaecological Surgery
- (15) Practical Manual in Laparoscopy and Minimally Invasive Gynaecology - A Clinical Cook book
- (16) Hysteroscopy Office Evaluation and Management of Uterine Cavity
- (17) Introduction to Gynaecological Endoscopy - Adrian Lower, Sutton
- (18) William's Text Book of Endocrinology
- (19) ABC of Genetics
- (20) Veech's Atlas of Embryology

Journals

3-5 International and 2 national journals (indexed)

Postgraduate Student Appraisal

Form Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory	Satisfactory	More Than Satisfactory	Remarks
		1 2 3	4 5 6	7 8 9	
1.	Journal based / recent advances learning				
2.	Patient based /Laboratory or Skill based learning				
3.	Self directed learning and teaching				
4.	Departmental and interdepartmental learning activity				
5.	External and Outreach Activities / CMEs				
6.	Research work				
7.	Log Book Maintenance				

Publications

Yes/ No

Remarks* _____

***REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.**

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD

MODEL PAPER

M.Ch-.....

Repro-I

M.Ch. Examination Month, Year
REPRODUCTIVE MEDICINE AND SURGERY

Paper-I

Basic Sciences relating to Reproductive medicine and Surgery

Time : Three Hours

Maximum Marks : 100

Attempt all questions

All questions carry equal marks

All the parts of one question should be answered at one place in sequential order.

Draw diagrams wherever necessary

- Q.1 Write down the normal anatomy and development of male internal genital tract. What are the stages of normal spermetogenesis.
- Q.2 Explain the neuro endocrine regulation of menstrual cycle and ovulation. Enlist the causes and endocrine evaluation of a cases of hpyogonadotropic hpyogonadism.
- Q.3 Classify different types of uterine anomalies, their impact on fertility and their management.
- Q.4 What are the causes of secondary amenorrhoea. How will you investigate and manage a case of intrauterine adhesions.
- Q.5 Enumerate the causes of hyperandrogenism in female. How will you evaluate and manage a hirsute woman.
- Q.6 What is the pathophysiology and staging of endometriosis. How does it affect fertility at different levels.
- Q.7 Enlist the causes of premature ovarian failure. Write down the evaluation and management of a case of ovarian agenesis.
- Q.8 Write in detail the different ovulogens used for COS, their mechanism of action, advantages and disadvantages.
- Q.9 Explain the etio pathogenesis of salpingitis, its evaluation and management.
- Q.10 Write down the classification of fibroid uterus. How do they affect fertility (type 2 & 3) and their management.

MODEL PAPER

M.Ch.-.....

Repro-II

M.Ch. Examination Month, Year
REPRODUCTIVE MEDICINE AND SURGERY

Paper-II
Principles of Reproductive Medicine and Laboratory Techniques

Time : Three Hours

Maximum Marks : 100

Attempt all questions
All questions carry equal marks.
Draw diagrams wherever necessary

- Q.1 Write down the criteria of semen analysis (WHO 2010). What are the different methods of semen preparation, their indication, advantages and disadvantages.
- Q.2 How will you evaluate and manage a case of recurrent early pregnancy loss. What are the different factors responsible for RPL.
- Q.3 Enlist the indications and steps of ICSI. What could be the early and late complications of ICSI in offspring.
- Q.4 What is the pathophysiology of luteal phase defect (LPD) in ART cycles. What are the different drugs and routes used for luteal support, their advantages and disadvantages.
- Q.5 Explain in detail the different protocols used for fertility preservation before chemotherapy depending on urgency and phase of menstrual cycle.
- Q.6 Write down the complications of ART. Explain the pathophysiology, criteria of classification and managements of OHSS.
- Q.7 What are the different methods used for tubal evaluation in infertile female, their advantages and disadvantages.
- Q.8 What is DFI and how does it affect the outcome of ART cycle in a subfertile male. What are the different methods of assessment of DFI.
- Q.9 Enlist the indications and steps of IUI. What are the different protocols used for COS in IUI.
- Q.10 What are the prerequisites for setup of an IVF lab. Write down the steps of quality control in IVF lab.

MODEL PAPER

M.Ch.-.....

Repro.-III

M.Ch. Examination Month, Year

REPRODUCTIVE MEDICINE AND SURGERY

Paper-III

**Fertility associated Medical and Surgical Diseases, Genetics, Counseling,
Ethical and Legal issues related to ART**

Time : Three Hours

Maximum Marks : 100

Attempt all questions

All questions carry equal marks.

Draw diagrams wherever necessary

- Q.1 Write down the genetic factors responsible for male infertility, their evaluation and management.
- Q.2 Explain the role of reconstructive microsurgery in tubal factor of female infertility and measures for prevention of post operative adhesion formation.
- Q.3 How will you evaluate a case of OATS. How does varicocele affect spermetogenesis and what are the indications and complication of varicocelectomy.
- Q.4 What are the different methods of surgical sperm retrieval, their indications, advantages & disadvantages.
- Q.5 Write down the indications for surrogacy. What are the ICMR guidelines 2019 for surrogacy.
- Q.6 What is the role of PGS in RIF. Write down the steps, advantages & disadvantages of D3 & D5 embryo biopsy.
- Q.7 How does hydrosalpinx affects implantation. How will you evaluate and manage a case of bilateral hydrosalpinx.
- Q.8 What are the ICMR guidelines for potential oocyte donor. How will you match a donor - recipient cycle.
- Q.9 What are the causes of failed fertilization. Write down the measures to be taken in IVF lab in case of failed fertilization.
- Q.10 Explain the pathophysiology of PCOS. What are different protocols used for COS in PCOS with their advantages and disadvantages.

MODEL PAPER

M.Ch.-.....

Repro.-IV

M.Ch. Examination Month, Year

REPRODUCTIVE MEDICINE AND SURGERY

Paper - IV

Recent advances in Assisted Reproductive Medicine and Surgery

Time : Three Hours

Maximum Marks : 100

Attempt all questions

All questions carry equal marks.

Draw diagrams wherever necessary

- Q.1 Write down the advantages of SET. Mention the different invasive and non invasive methods of embryo selection for SET.
- Q.2 Enumerate the different methods of sperm selection in case of severe OATS and role of microfluidics.
- Q.3 What are nuances in medical management of advanced stage endometriosis. Explain the role of surgery before IVF.
- Q.4 Write down the different practices used for endometrial improvement in a case of persistently thin endometrium. Write in detail about the role of PRP.
- Q.5 Write down the different protocols of COS in poor responders their advantages and disadvantages. Write in detail the role of dual stimulation.