Recommended practices for the management of embryology, andrology, and endocrinology laboratories: a committee opinion

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This document provides a general overview for physicians of the qualities and conditions necessary for good management practices within the endocrinology, andrology, and embryology laboratories in the United States. It is intended as an addendum to previously published guidelines that further detail these responsibilities. (Fertil Steril® 2014;■:■–■. ©2014 by American Society for Reproductive Medicine.)

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This document provides guidelines for the reproductive endocrinology and infertility (REI) specialist regarding the qualities and qualifications that constitute good management and practice within endocrinology, embryology, and andrology laboratories. It is intended to supplement, but not supplant, information provided in the American Society for Reproductive Medicine (ASRM) document titled "Revised Guidelines for Human Embryology and Andrology Laboratories" (1).

GENERAL GUIDELINES

All laboratories, whether located in university, hospital, or private settings, should be registered, accredited, and certified at the national level, and if located in a state with specific licensure requirements, at the state level (2, 3). It is the responsibility of the laboratory director to ensure that all documentation and licensure requirements are met. This requirement applies to REIs who are listed as the laboratory director, as well as to off-site directors who are specifically hired for this duty.

All accredited laboratories must document an ongoing quality control (QC) program for each test and piece of equipment within the laboratory. The laboratory must also participate in a quality assurance program that includes continuous quality improvement (CQI) assessments and participation in proficiency testing for all laboratory testing procedures.

The laboratory must maintain documentation of all activities that are conducted within the laboratory. These include current policy and procedure manuals as well as manuals or documentation of laboratory safety, infection control, disaster plans, Health Insurance Portability and Accountability Act (HIPAA) procedures, chemical hygiene, and laboratory personnel.

In addition, laboratories must employ and maintain a system that provides proper patient preparation and identification; proper patient specimen collection, preservation, transportation, and processing; and accurate reporting of laboratory test and procedural results. This system must assure optimum patient specimen integrity and positive identification throughout the preanalytic (pretesting), analytic (testing), and postanalytic (posttesting) processes, and it must meet the individual test standards (4).

A laboratory director or supervisor who meets the qualifications defined in the Clinical Laboratory Improvement Act of 1988 (CLIA'88) (1, 4) must supervise the activities in all sections of the laboratories, including

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endocrinology, andrology, and embryology. A laboratory director may supervise the endocrinology, andrology, and embryology sections of no more than 5 separate CLIA-licensed laboratories. Laboratory directors should have an intimate knowledge of all procedures performed in these laboratories and be available to provide consultation when required. Laboratories that participate in high-complexity testing (i.e., quantitative semen analyses and some hormone analyses) must be supervised by a laboratory director who meets the CLIA'88 standards as a high-complexity laboratory director (HCLD; 1, 4). Individuals who have an embryology laboratory director certification and do not have an HCLD certification may not direct high-complexity testing laboratories.

If the laboratory director does not provide day-to-day supervision of testing personnel and reporting of proficiency testing results, the laboratory should have at least one laboratory general supervisor who performs these duties under the direction of the laboratory director. Duties delegated to the supervisor by the laboratory director should be documented. The general supervisor must meet CLIA'88 standards and must be licensed by the state if such licensure is required (1, 4).

Testing personnel must also be licensed as per state requirements and must meet CLIA'88 guidelines. Testing personnel are laboratory personnel who are trained to perform specific laboratory procedures but are not certified to perform the duties of the laboratory director or allowed to supervise other laboratory personnel. An individual licensed or certified as an HCLD or general laboratory supervisor automatically meets the requirements for testing personnel and may fill both roles. In smaller laboratories, the laboratory director can function as the general supervisor and testing personnel.

ENDOCRINE LABORATORIES

All high-complexity hormone testing performed in endocrine laboratories as defined by CLIA'88 must be supervised by a certified HCLD (4). If the hormone testing performed in an endocrine laboratory is classified as being of moderate complexity, the laboratory can be supervised by a laboratory supervisor (1, 2).

There must be procedure manuals that specify protocols for specimen handling and processing, testing methodology, QC, CQI, reporting of procedure results, troubleshooting, and documentation of corrective action for laboratory errors. The laboratory director or supervisor is responsible for the maintenance, review, and updating of all the testing methodology; review and follow-up of results; oversight and sign-off on all corrective actions for laboratory errors; and personnel training and compliance issues.

Testing personnel are responsible for test execution as indicated in the procedure manuals; identification of testing issues; maintenance of patient confidentiality; timely reporting of results; maintenance and management of equipment used in testing procedures; inventory control; and reporting abnormal or out-of-range results to the laboratory director or supervisor.

ANDROLOGY LABORATORIES

The andrology laboratory is responsible for the analysis of semen to aid the clinician in the diagnosis of male fertility potential and for the preparation of sperm for intrauterine insemination (IUI), in vitro fertilization (IVF) insemination, and/or sperm cryopreservation (5–8). Some of the testing and clinical procedures that may be performed in an andrology laboratory include:

1. Semen analysis;
2. Sperm preparation for IUI and IVF;
3. Sperm cryopreservation; and
4. Sperm function testing.

Laboratory personnel who perform the above procedures have been loosely referred to as andrologists. However, the role of an andrologist has not been formally defined by any medical board or medical society. In most andrology laboratories, laboratory personnel are classified as andrologists if they have been trained and certified by the laboratory director to perform all or most of the laboratory's andrology procedures. Laboratories that classify laboratory personnel as andrologists should define their criteria for the title of andrologist in their policy and procedures. These criteria should include a description of the type of training and testing that are required to demonstrate the person's proficiency in performing the required andrology procedures.

Policy and procedure manuals must be readily available for all laboratory procedures. However, it is recognized that there is not a single standardized protocol for all laboratory procedures. In the absence of a standardized protocol, each laboratory must develop its own protocols with controls and methodologies to assure reliable and acceptable results. Currently recognized standards for semen analyses and sperm testing are detailed in the World Health Organization (WHO) Laboratory Manual for the Examination of Human Semen and Semen–Cervical Mucus Interaction (5).

If only qualitative semen analyses are being performed (i.e., reporting only the presence or absence of sperm in the ejaculate), the andrology laboratory does not require oversight by an HCLD. However, if the analyses are quantitative (i.e., reporting of sperm concentration, sperm motility, and/or sperm morphology), then these tests are considered to be of high complexity and must be overseen by a certified HCLD, and laboratory personnel must meet all the qualifications mandated by CLIA'88 (1, 4).

All laboratory personnel are responsible for compliance with HIPAA requirements, the chain of custody for specimen tracking and handling, timely reporting of results, identification of outlying or out-of-bounds results to the supervisor, and informing the director of any proficiency testing, QC, or CQI issues that do not meet laboratory standards.

Laboratories should have a procedure for specimen log-in with the appropriate information on the specimen to allow identification of the sample source as well as the sample recipient (if applicable). The laboratory must document when a specimen was tested and the result, the name of the requesting physician to whom the result or specimen will be issued, and a unique code that identifies the patient. All test records

should identify the performing technician and the reference ranges. The laboratory director or supervisor should review results of diagnostic tests, and these records must be kept for at least 2 years. For specimens that have been stored, records should be maintained in accordance with current registry requirements.

EMBRYOLOGY LABORATORIES

Embryology procedures, including the classification of embryo morphology, have not been designated as high-complexity tests by CLIA'88. If the embryology laboratory does not perform diagnostic semen analyses, which are considered highly complex procedures, then HCLD certification of the laboratory director is acceptable but not required. An individual certified as an embryology laboratory director or laboratory supervisor can direct an embryology laboratory that does not perform any high-complexity testing (1, 4).

The laboratory director should have expertise and/or specialized training in biochemistry, cell biology, and physiology of reproduction, with experience in experimental design, statistical analysis, and laboratory problem solving. The director should be responsible for formulating the policies and protocols and communicating with the medical director all information concerning patient progress and protocols.

Embryology laboratory procedures include:

1. Culture media preparation and laboratory QC;
2. Oocyte isolation and identification;
3. Oocyte maturity and health status assessment;
4. Oocyte insemination;
5. Evaluation of fertilization;
6. Zygote quality assessment;
7. Embryo culture and grading;
8. Embryo transfer;
9. Gamete or embryo cryopreservation; and
10. Micromanipulation of gametes and/or embryos, including intracytoplasmic sperm injection, assisted hatching, and embryo biopsy.

Laboratory personnel who perform the above procedures are referred to as embryologists. As is the case with andrologists, the role of an embryologist has not been formally defined by any medical board or medical society. However, in most embryology laboratories, laboratory personnel are classified as embryologists if they have been trained and certified by the laboratory director to perform all or most of the laboratory's embryology procedures. Laboratories that classify personnel as embryologists should define their criteria for the title of embryologist in their policies and procedures. These criteria should include a description of the type of training and testing that are required to demonstrate the person's proficiency in performing the required embryology procedures.

The embryology laboratory director or supervisor must establish the policies and procedures for his/her lab. The challenge in any embryology laboratory is identifying appropriate procedures that will maximize pregnancy outcomes and safety. There are no universally recognized protocols for performing embryology procedures. Therefore, appropriate key performance indicators (KPIs) for laboratory success should be identified and regularly monitored (1, 9, 10). These KPIs should assess characteristics that are essentially under the control of the laboratory. Examples include: fertilization rate, embryo degeneration rate after intracytoplasmic sperm injection, blastulation rate, and cryopreservation survival rate. Review of KPI with clinical personnel should be a routine part of CQI processes. More-specific details for the management and oversight in the embryology laboratory may be found in the Revised Guidelines for Human Embryology and Andrology Laboratories (1).

Due to the limited standardization of assisted reproductive technology (ART) procedures, it may be difficult to identify the source of problems when a program does not produce pregnancy rates comparable to the national success rates as established by the Society for Assisted Reproductive Technology (SART) and the Centers for Disease Control and Prevention (CDC). Pregnancy rates are a collective result of patient characteristics, stimulation protocols, laboratory handling of oocytes/embryos, embryo-transfer technique, and post-transfer management of the patient (11–15). Therefore, it is critical that laboratory scientists work closely with the physicians of their program to assess overall pregnancy success rates.

In summary, these guidelines are intended as a synopsis for physicians to assess the overall performance of the laboratories associated with an REI practice. There is no formula that must be followed by every laboratory to achieve the required goal of producing a high-quality laboratory, and variability will exist among laboratories in terms of the actual execution and performance of these guidelines.

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