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Commentary

Critical appraisal of the Vienna consensus: performance indicators for assisted reproductive technology laboratories

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A B S T R A C T

The Vienna consensus, based on the recommendations of an expert panel, has identified 19 performance indicators for assisted reproductive technology (ART) laboratories. Two levels of reference values are established for these performance indicators: competence and benchmark. For over 10 years, the Spanish embryology association (ASEBIR) has participated in the definition and design of ART performance indicators, seeking to establish specific guidelines for ART laboratories to enhance quality, safety and patient welfare. Four years ago, ASEBIR took part in an initiative by AENOR, the Spanish Association for Standardization and Certification, to develop a national standard in this field (UNE 17900:2013 System of quality management for assisted reproduction laboratories), extending the former requirements, based on ISO 9001, to include performance indicators. Considering the experience acquired, we discuss various aspects of the Vienna consensus and consider certain discrepancies in performance indicators between the consensus and UNE 179007:2013, and analyse the definitions, methodology and reference values used.

Introduction

The assisted reproductive technology (ART) laboratory is of crucial importance in fulfilling the reproductive wishes of infertile couples and of women without a male partner, in preventing the transmission of infectious or hereditary diseases and in the cryopreservation of gametes and embryos. Like any other clinical laboratory, it must meet its users' needs while providing quality, safety and efficiency. Performance indicators are recommended as a means of monitoring

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and improving performance in clinical laboratories (in accordance with ISO 15189-2012). For performance indicators to be effective, it is essential to have a clear and precise definition of each one, and to establish realistic performance targets (reference value or performance specifications). Following a recent consensus workshop held in Vienna (ESHRE Special Interest Group of Embryology and Alpha Scientists in Reproductive Medicine, 2017), the recommendations of an expert panel of participants, on a total of 19 performance indicators for ART laboratories, have been published. The reference values for these performance indicators address two levels, competence and benchmark, in line with an earlier consensus on cryopreservation (Alpha Scientists in Reproductive Medicine, 2012).

In 2013, AENOR, the Spanish Association for Standardization and Certification, published a national standard (UNE 179007, 2013 System of quality management for assisted reproduction laboratories) defining specific requirements for human ART laboratories, with the aim of enhancing quality, safety and patient welfare. Participants in this project included members of the Spanish Association of Embryology (ASEBIR), the Spanish Fertility Society, the Spanish Society of Clinical Biochemistry and Molecular Pathology and the Spanish Andrology Society, as well as public and private human IVF clinics, AENOR, professional associations and the public-sector health administration (UNE179007, 2013, 2013; Ortiz et al., 2014).

The new standard for human ART laboratories, UNE 179007:2013, strengthens the ISO 9001 requirements in the following areas: training, e.g., the head of the embryology laboratory must have a biomedical science degree, a PhD or Master's degree and at least 5 years' relevant experience; professional tasks, such as stipulating the responsibilities of the head of the embryology, andrology and cryopreservation laboratory; minimum human and infrastructure resources and necessary environmental conditions, such as cleaning and disinfection, personnel clothing, air conditioning, air recycling and filters, positive pressure; control of laboratory equipment, e.g., calibration and validation, control type, frequency, parameter, measurement range and acceptance criteria; traceability (in relation to the embryologist responsible and the culture media, material and equipment used); product preservation, e.g. contingency and transport protocol, product data saved in two separate supports; and laboratory indicators (definition, method, periodicity). Special Interest Group in Quality of ASEBIR published indicators for these requirements in 2007 (de los Santos et al., 2007), and quality specifications for these performance indicators have been adapted and updated annually since 2009 (Mantilla et al., 2015). Since the publication of UNE179007:2013, ASEBIR has published annual quality specifications for ART laboratory performance indicators for three levels of quality (minimum, desirable and optimum) based on the state of the art.

Since the publication of the new quality management system, to adapt ISO 9001 for use in human ART laboratories, over 20 Spanish laboratories have been certified, which has enabled them to improve their monitoring and measuring procedures via the standardization of laboratory processes. This national experience provides the basis for our discussion of various aspects of the Vienna consensus document on performance indicators in ART laboratories.

Establishing quality specifications

The question of how to define reference performance indicator values for a clinical laboratory has been subject to much debate. For many years, the benchmark was the Stockholm hierarchy of performance goals (Kenny et al., 1999), five criteria based on clinical outcomes, physician's opinion or biological variation, professional recommendations, external quality assessment results and current performance (state of the art). In the context of an ART laboratory, the following criteria have been applied as quality specifications for performance indicators of the analytical phase of determining semen parameters: biological variation (Álvarez et al., 2003), state of the art (Castilla et al., 2005) and physician's opinion (Aguilar et al., 2008).

In 2015, seeking to remove some inconsistencies from the Stockholm hierarchy, a new proposal was made in this respect (Sandberg et al., 2015), according to which one of the following models should be selected: model 1, based on the effect of analytical performance on clinical outcomes; model 2, based on components of biological variation of the parameter analysed; or model 3, based on the state of the art. These criteria have been used by ASEBIR to establish quality specifications for ART laboratory performance indicators for the past 10 years. Therefore, the criterion of expert recommendations has been deleted, in the assumption that the expert making such recommendations will be aware of the state of the art (Jones et al., 2017). Following this update of the Stockholm hierarchy, in our opinion the criteria used by the Vienna consensus workshop are less appropriate than methods based on the state of the art.

It is no easy matter to establish quality specifications for ART laboratory performance indicators. Extrapolating useful models to obtain quality specifications with which to diagnose or monitor laboratory processes, to achieve viable gametes and embryos, is always a complicated procedure. In fact, the only criterion that can be applied straightforwardly is that of state of the art. When this criterion is used in analytical testing, data are obtained from an external quality assurance programme (EQAP) in which several clinical laboratories analyse the same sample. Although in ART laboratories, EQAP are used to assess embryo quality (Martínez-Granados et al., 2017a, 2017b; Ruiz de Assín et al., 2009), cytotoxicity (Castilla et al., 2010) and semen analysis (Alvarez et al., 2005), these programmes cannot be used to establish Vienna Consensus quality specifications for performance indicators.

On the other hand, as Vienna consensus recommends, what can be done is to examine the results reported by each laboratory to the national ART register, to determine the state of the art for certain performance indicators. Nevertheless, any comparison of data from different laboratories will always be difficult because performance indicator differences between ART clinics may be explained (at least in part) in terms of two basic types of variation: common cause variation, owing to data quality, e.g. different definitions of a single performance indicator, differences in patient characteristics (or case mix) or simply the effect of chance (particularly in the case of small numbers of patients); or special cause or systematic variation, caused by real quality differences between laboratories (Lee and McGreevey, 2002).

The ASEBIR quality specifications for ART laboratory performance indicators are based on data obtained from the official ART register compiled by the Spanish Ministry of Health and Spanish Fertility Society, which are used to derive quality specifications based on the state of the art. To minimize the effects of poor-quality data, participation is compulsory. This database is standardized and centralized, and over 15% of the participating centres are audited by an independent contract research organization. The participating centres in the official ART registry are randomly selected for auditing. These audits are carried out by external companies specialized in clinical trials and

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