



Occupational Proficiency Testing & Certification: A Critical Discourse on Indian Forensics

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Abstract

Regular proficiency testing of forensic examiners is required at accredited laboratories and is widely accepted as an important component of a functioning quality assurance program. Yet, unlike in other testing industries, the majority of forensic laboratory testing programs rely entirely on declared proficiency tests. Some laboratories, primarily federal forensic facilities, have adopted blind proficiency tests, which are also used in the medical and drug testing industries. The reliability and value of forensic science evidence are extremely linked to the rates at which examiners make errors. Jury members cannot usually assess the significance of a reported forensic science match without having some information about the rate at which false-positive errors occur. This paper reviews the occupational proficiency organizations and calls for the implementation of proficiency tests that are designed and administered for the express purpose of providing fact-finders with reasonable first pass estimates of error rates across forensic disciplines and techniques. Due to the errors in the experiments and results, justice could be denied to many innocents, this eventually leads to the submission of wrong reports of the case as well. India is continuing to be a great part of this error process. A proficiency-testing plan that addresses each of these issues is identified.

Keywords: Forensic science; Proficiency tests; Error rates; Certification; Forensic examiner; Indian Forensics

Abbreviations: PT: Proficiency Testing; ISO: International Organization for Standardization; CFCE: Certified Forensic Computer Examiner; CTS: Collaborative Testing Services; EQASs: External Quality Assessment Schemes; BUA: Bundesverband der Messstellen für Umwelt- und Arbeitsschutz; NVLAP: National Voluntary Laboratory Accreditation Program; NIST: National Institute of Standards and Technology; ANAB: ANSI National Accreditation Board; IAF: International Accreditation Forum; ILAC: International Laboratory Accreditation Cooperation; NAPT: The National Association for Proficiency Testing; NABL: The National Accreditation Board for Testing and Calibration Laboratories;

PTC: Proficiency Testing and Certification.

Introduction

Large number of 'Occupational Proficiency Testing' initiatives which emphasize the importance of the validation of analytical results are increasingly organized. Keeping aside the similarities of the schemes, there are many differences too at various levels like factors related to relationship with legislation, national status, type and quality of proficiency testing material, analytical range and priorities for future development. Accreditation and Quality Assurance is a forum applicable to quality, transparency and reliability of

measurement results in chemical and biological sciences. Quality does not exist in a vacuum, whereas the governance, funding, procurement and provision of forensic science all play a major part. Achieving accreditation to a top quality standard is neither the start nor the top of improving quality. Engendering a real culture of quality requires ongoing leadership and investment in people, processes and innovation [1]. The use of proficiency testing is an important tool for validating uncertainty claims contained within a Scope of Accreditation. Therefore, the instability that has continued to be seen during this reporting year represents a big risk to quality. Accreditation is associated with a conformity assessment body, which conveys formal demonstration of competence. Laboratory accreditation is a process by which the body recognizes the competence for specific tests by following international standards. Reference Material Producers Accreditation gives formal recognition of competence to hold out the assembly of reference materials supported third party assessment and following international standards [2].

The work in Forensic Science Laboratories being interdisciplinary in nature is required to develop General Criteria for Laboratory Accreditation for accrediting Forensic Science Laboratories. Many laboratories operate in isolation from other laboratories and usually can't match their data with others. Without such opportunities, there are risks that the details may have errors or biases. Proficiency testing provides a chance to undertake such comparisons and to provide appraisal of the laboratory's data compared to reference values as well as to the performance of other laboratories. The results help laboratory managers with a confirmation about the laboratory's performance and about the potential problems [3]. Comparison of the performance of a facility's performance with that of other peer facilities, Monitoring of the long-term performance, Improvement in the performance of tests and identification of the causes of lesser PT results, and the use of corrective action to prevent them from re-occurring, Staff education, training, and competence monitoring, Evaluation of methods including the establishment of method precision and accuracy etc. Proficiency testing providers play an important role in the value chain for the assurance of products and services. According to ISO/IEC 17043:2010, proficiency testing (PT) is the evaluation of participant performance against per-established criteria by means of inter-laboratory comparisons [4].

Procedures

General Test methods and procedures used must be accepted in the field or supported by data gathered and recorded in a scientific manner. For e.g.: Examiners in serology

must have access to well established population data bases on the distribution of all genetic markers which are typed in the laboratory and should have access to generate local population data bases on the distribution of all the genetic markers which are typed in the laboratory. Where sampling is carried out as a part of the test method, documented procedures that include a sampling plan using appropriate statistical techniques must be used. Accreditation cannot be granted for examinations that a laboratory has never performed or for which records of performance are not available.

Documentation Test methods and related procedures are documented and readily available to the examiners. Documentation of methods and procedures must include description of the sample to be examined, quantities to be determined and instrumentation required.

In Toxicology, independent performance assessment for laboratories who check upon routine quantification of therapeutic drugs is done. Concentrations of specific drugs at certain intervals in people, usually through blood samples is carried out. Monitoring of drugs is usually not required as they have a wide therapeutic index. Factors that influence serum drug levels are often noted and thus the testing process is completed [4]. For DNA analysis groundwork for using next generation DNA sequencing for human identification is laid. Scientific foundation reviews DNA mixture interpretation is conducted and physical reference standards are manufactured to ensure better results [5].

Proficiency Testing Standards

The International Organization for Standardization (ISO) has a standard proficiency testing.

Current and Active Standards

- 1) ISO/IEC 17043:2010 – Conformity Assessment – General Requirements for Proficiency Testing
- 2) ISO 13528:2015 – Statistical methods for Proficiency Testing used by Interlaboratory Comparisons.

Obsolete and Withdrawn Standards

- 1) ISO Guide 43-1:1997 – Proficiency Testing by Inter-laboratory Comparisons – Part 1: Development and Operation of Proficiency Testing Schemes.
- 2) ISO Guide 43-2:1997 – Proficiency Testing by Inter-laboratory Comparisons – Part 2: Selection and Use of Proficiency Testing Schemes by Laboratory Accreditation Bodies.

- 3) ISO 13528:2005 – Statistical Methods used in Proficiency Testing by Inter-laboratory Comparisons.

Few Forensic Proficiency Testing Services and Accreditation Boards

Certified Forensic Computer Examiner (CFCE), USA

CFCE certificants need to take proficiency tests so on satisfy the requirements. CFCE recertification requirements should be completed after every other third year also as a proficiency exercise to remunerate accreditation, professional certification, or organizational requirements required by their employer or laboratory. Proficiency tests are supported by a gaggle of approved CFCE core competencies. The proficiency examinations includes practical skills as well as knowledge points that could be demonstrated. So, certificants are expected to perform actual forensic examination and answer questions regarding their examination findings. Proficiency tests are usually only available to current CFCE certificants. 90 days are allotted to finish the certification and a minimum score of 80% should be attained to pass. Certificants are expected to try to the recertification formalities completed after three years of initial certification [6].

Collaborative Testing Services (CTS), USA

CTS is the foremost important forensic proficiency test provider, which has set the benchmark for forensic tests since 1978. Organizations across the globe address CTS to satisfy their proficiency testing necessities. Since differences between PT schemes are recognized at the ECU level by organizers of PT schemes and external quality assessment schemes (EQASSs) it seems appropriate to strengthen collaboration between scheme organizers to enhance the standard of analytical performance in occupational and environmental health [7].

Proficiency testing at the IFA, Germany

The Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) has been serving PT schemes for laboratories worldwide who aim for self-examination and reviewing quality standards laboratories. The IFA organizes the PT schemes in collaboration with the Bundesverband der Messstellen für Umwelt- und Arbeitsschutz (BUA), the German association of environmental and OSH measurement bodies. The BUA recommends regular participation in IFA's proficiency testing. The PT schemes are offered during which the entire analysis method and the participants will receive a deep evaluation along with a certificate of participation [8].

National Institute of Standards and Technology (NIST) Proficiency Testing, U.S

A NIST Proficiency Tests works by comparing the performance of a customer machine to a minimum of fifty other customers, by using general statistics that provides performance details of the machine. The NIST Thermometry Group conducts proficiency testing for National Voluntary Laboratory Accreditation Program (NVLAP) accredited contact thermometry laboratories. The proficiency tests are thus designed to identify confidence within the calibration capabilities of participants [6].

The ANSI National Accreditation Board (ANAB), US

The ANAB is that the largest multi-disciplinary accreditation body with around 2,500 organizations accredited in approximately 80 countries. It's accreditation portfolio includes management systems certification bodies, calibration and testing laboratories and forensic laboratories, product certification bodies, inspection bodies and forensic agencies etc. ANAB provides training on accreditation standards and conformity assessment. ANAB has a signatory status across multilateral recognition arrangements of the International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). ANAB provides accreditation on the basis of ISO standards and industry requirements [9].

The National Association for Proficiency Testing (NAPT), US

NAPT is an accredited proficiency testing provider by the ANSI National Accreditation Board (ANAB). The main objective is to provide professional management and program administration, coordination, data processing and reporting for inter laboratory comparisons and proficiency testing, thus assisting organizations in meeting accreditation essentials [10].

The National Accreditation Board for Testing and Calibration Laboratories (NABL), India

NABL is an accreditation body which provides voluntary accreditation services to Testing laboratories, Calibration laboratories, Medical testing laboratories, Proficiency Testing Providers, Reference material producers etc. NABL provides accreditation in major fields of Science and Engineering like Biological, Chemical, Electrical, Electronics, Mechanical & Forensics disciplines under testing facilities. NABL accredits Proficiency testing providers & Reference Material producers. Laboratory Accreditation activities are administered under the direction of the Board NABL [11].

NABL has adopted the following four objectives, which define the purpose and nature of the programme:

- To improve the quality of laboratory services provided to criminal justice system.
- To maintain criteria used by a laboratory to assess its level of performance and to strengthen its operations.
- To provide an independent, impartial and objective system by which laboratories can be benefited through a total operational review.
- Identification of laboratories who established standards.

Role of Proficiency Testing and Certification (PTC)

The PTC oversees the ethics standards and self-regulatory processes thus serving to protect the integrity of the profession. Proficiency testing and certification helps in demonstrating competency and validating a laboratory's measurement process. PTC can be used to validate a measurement method, technical training of personnel, traceability of standards, initiates reskilling and upskilling of the professionals, removes analytical bias and false positive and false negative, reduces the cases with no definite findings and estimation of measurement uncertainty. When a laboratory adds a new measurement or testing capability to accreditation. With the help of PTC laboratories can externally validate new measurement or testing process. PTC enables participants to confirm their ability to perform tests competently which is essential in the laboratory accreditation process, gives an early indication of potential problems or training requirements, encourages good performance and reinforce an interest in quality assurance, demonstrates an ability to comply with international regulations, provides a valuable source of information, provide the means to measure consistency across a group of laboratories [1,12].

The purposes of PTC includes:

- a) Performance evaluation of laboratories
- b) Identification of problems in laboratories and initiation of improvement actions
- c) Effective establishment and comparability of test
- d) Identification of inter-laboratory differences
- e) Education of participating laboratories
- f) Validation of uncertainty claims

Problems and Pitfalls in India

Forensic science has transformed the criminal trial process. The potentiality of scientific evidence in criminal investigation is undisputed, but the role of the legal stakeholders in screening the evidence is always a controversial topic throughout the globe [4]. The most alarming thing is the reporting of some false convictions as a result of faulty forensic evidence and around 318 convicts

who were convicted due to inappropriate evidence in India. Similar to the U.S. or U.K., in India the application of criminalistics is very less. The police will directly enter into the scene and disturb and evidences. The forensic scientific evidence is flowing into the courtroom in an incomplete nature and is an accepted fact in both forensic and legal community that if the evidence is not communicating to the courtroom in the form of probabilistic calculations, it is worthless since it is the only way in which the scientists can properly convey it to others [12]. Hesitation in implementation of PTC and the absence of guidelines by the Directorate of Forensic Science Services also serves as one of the major to the pitfalls in India.

Factors that affect the reliability of case specific application of techniques are:

- 1) Scientific uncertainty
- 2) Lack of research
- 3) Forensic science as neglected discipline
- 4) Absence of well defined code of ethics
- 5) Lack of certification to the technical personnel's
- 6) Lack of national database for identification evidence
- 7) Lack of error rate statistics for techniques

In the U.S. The National Institute of Forensic Science (NIFS) has about a national code of ethics for all forensic science disciplines. Quality assurance in forensic service is another challenge. The quality of the evidence depends on several factors like validation of a way, instrumental quality check, capacity of the persons employed, standard protocol, and accreditation of the crime labs and certification of the scientists. A compromise in these factors will directly affect the quality and reliability of test results [13].

Errors in Forensics and Miscarriage of Justice

A lack of universal, required professional certification in forensic science has often been a basis of criticism of the discipline [14]. The relationship between forensic science and miscarriages of justice is intricate and puzzling. Miscarriages of justice are usually unknowable [3]. Forensic science has emerged as a big contributor to miscarriages of justice. Scientists serving for the government sectors started believing that switching to private and in-house police labs will reduce interpretation impartiality, and thus resulting in accuracy of evidence. Issues related to the biasness in forensic science is never a new plot to discuss about. Scientists even admit the fact that they sometimes feel pressured to produce a particular result and even insufficient time to evaluate cases is another problem that exists. Usually obtaining information from the scientists are never too easy because they are prohibited from expressing opinions in public [15]. More and more cases are being broken into component parts and incomplete examinations are requested of personal

laboratories because in-house police laboratories believe they're saving money. Innocent people are being wrongly convicted and criminals are escaping justice due to the failure of the forensic science system thus resulting in wide-range of problems threatening the safety of justice. Forensic science has been performing crucially for years, with skills shortages and choices between operational deployments to be made along with ensuring basic quality-assurance measures. Evidence from some experts testifying in court aren't scientifically justifiable, lack of funds have led to parts of the forensic science system operating at its capacity [13].

Problems with crime scene investigators raises a danger to contamination of the crime scenes. Forensic science malpractice, whether intentionally or accidentally made, increases risk to the criminal justice system. Like all critical professions, forensic science is also shown within the media as having negative impact on our criminal justice system is an injustice as the professionals are trying to nullify the errors in the field. To say a forensics mistake has led to an innocent man being held for five months on a charge of rape in the UK because of the DNA contamination during DNA extraction procedure [16].

Case Studies

Amanda Knox

On All Souls' Day, 2007, American college man Amanda Knox returned to her flat in Perugia, Italy. She found the rest room she shared along with her roommate, Meredith Kercher, covered in blood. Knox had spent the night along with her boyfriend, Raffaele Sollecito, and she or he or he attempted to urge into Kercher's room, which was locked. Filomena Romanelli returned home and began rummaging around unknowingly disturbing the crime scene. Autopsy reports indicated that the bulk of Kercher's injuries bruising and cuts near the genital region point towards sexual violence. Both Knox and Sollecito were arrested and charged with Kercher's murder due to Knox's DNA found on the kitchen knife. Later on police uncovered fingerprints and DNA belonging to Rudy Guede, who had gone on a date with the victim the night of her murder. On March 27, 2015, both Amanda Knox and Raffaele Sollecito were exonerated for the murder of Meredith Kercher.

OJ Simpson

On June 13, 1994, in U.S. the bodies of Ron Goldman and ex-wife of OJ Simpson, Nicole Brown, were found outside of Brown's home. When detectives received OJ Simpson's home to inform him of the death of his ex-wife, they noticed blood on Simpson's white Ford Bronco. Detective claimed that Simpson might have been injured. During the trial, all of the

missteps of the forensic team came to light, including the likelihood of evidence tampering. The defense noted several items including a vial of blood from OJ Simpson gone missed. OJ Simpson was found acquitted on October 3, 1995.

David Camm

On September 28, 2000, in U.S., David Camm a retired Indiana State Trooper returned home to hunt out his wife and two children dead of gunshot wounds. Camm believed his son was still alive and attempted CPR on the seven-year-old. Camm was arrested for the deaths of his family. A state forensic investigator said that Camm's t-shirt had been stained with the wife's blood in patterns. In 2004, the Indiana Court of Appeals overturned the conviction and ordered a replacement trial. The case caught a chance in 2005 when the DNA of a career criminal, Charles Boney, was matched to a sweatshirt at the scene of the crime. Boney's history included attacking women. Boney ultimately claimed it had been Camm who murdered the family. Camm was charged once again this time as a co-conspirator with Boney. In 2009, the convictions were reversed by the Indiana Supreme Court. The defense presented evidence that the initial blood splatter expert had falsified his credentials. Later Boney's DNA under Kim Camm's fingernails and her DNA on his sweatshirt sealed his conviction. After spending 13 years in prison for the deaths of his wife and two children, David Camm was acquitted and released [17-19].

Conclusion

Even if Proficiency Testing is not strictly required by the international standard, it is highly recommended by international committees and accreditation bodies. The accuracy of claims that faulty forensic science may be a leading explanation for wrongful convictions is still high. Proficiency testing is widely used across many scientific disciplines as an integral part of the quality control and risk reduction process. These schemes confirm the analytical laboratory with the ability to assess performance. The ongoing assessment of performance using proficiency testing allows the identification of areas for training and improvement and may also assist with audit processes.

Proficiency tests serve many purposes as they may be used to train personnel, promote baseline competency levels, improve laboratory practices and procedures, and identify future needs for a laboratory or technique. These are valid and important purposes. However, they are not the only purposes of proficiency tests and they are not of concern in the present article. Instead, this article focuses on using proficiency tests to identify reasonable first pass estimates for the rates at which various types of forensic errors occur. Researchers have long suggested that it is crucial to measure

error rates for the various forensic sciences. Implementing strict protocols regarding the efficiency of the analysts, regular calibration of the instruments being used, checks on the procedure being followed in laboratories along with periodical certifications will bring a great change to this situation [20,21].

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