# QUALITY

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**ABSTRACT:** Forensic Science Laboratories cannot afford to make mistakes or mislead an investigation or the courts. It is therefore essential that the services they provide are of the right quality. This involves more than just the implementation of a quality management system. The use of competent staff and the right philosophy of approach are also essential. The presentation will explore these issues and the extent to which ENFSI is responding to them.

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## INTRODUCTION

In forensic science laboratories, the work we do involves carrying out tests on material from scenes of crime and persons involved in offences, either as suspects or victims. This is an onerous responsibility, and huge consequences can rest on the outcomes of our tests and their interpretation. If just one of the tests is unreliable, or the results are misinterpreted, an innocent person may be wrongly convicted, or a guilty person may remain at large. Whichever, the reputation of the scientists involved, and the whole laboratory, will be diminished.

In the United Kingdom, we had too many miscarriages of justice in the 1970's and 1980's that were laid at the door of forensic science. For example, you may recall the unsafe conviction of the Birmingham 6. Key evidence in this trial was the detection of nitroglycerine on the hands of suspects and the ability of the Griess test to discriminate between nitroglycerine (from explosives) and nitrocellulose (from playing cards). The scientist claimed that this was possible, by using a more dilute solution of sodium hydroxide than normally specified. But no validation of this claim had been carried out and subsequent testing has shown clearly that it is in fact not possible to detect low levels of nitroglycerine using the more dilute sodium hydroxide. Then we had the unsafe conviction of the Guildford 4. There were a number of reasons for this, but criticism was made of the involvement of an inexperienced student in generating the crucial laboratory results. And we had the Kiszko

case. This was a murder enquiry where sperm heads were recovered from staining on the deceased's clothing, but not from a semen sample produced by the suspect, Kiszko. Kiszko admitted to ejaculating over the deceased's knickers, and blood grouping results were consistent with this, but the fact that Kiszko was aspermic was not reported in the scientist's statement. The significance of this was consequently not explored further and he was wrongly found guilty.

It is thus essential that we take all reasonable steps to minimise the risk of error and avoid misleading an investigation or the courts. This is what quality in forensic science is all about. But how can we best achieve quality in practice? What will it cost?

Let me say first that quality does not come cheap. The typical industry average for all activities contributing towards quality assurance is about 15–25% of turnover and we estimate that the costs to the Forensic Science Service fall within that range. But this has to be balanced against the added confidence that accrues from this investment and the cost of quality failures. In my view, there can be no doubt that quality assurance is essential.

I would like to suggest that there are three complementary strands to enable a laboratory to provide quality services: establishing a quality management system, having competent staff and adopting the right philosophy of approach.

## QUALITY SYSTEMS

There is nothing to stop laboratories developing their own quality systems on an *ad hoc* basis, formalising those practices they find most useful to their business. However, it is usually better for a laboratory to base its system around one of the more established quality standards. A well-designed system will consist of a balance of input controls (measures taken to foster quality) and output controls (measures to monitor whether the desired level of quality is being achieved).

The main quality standards used by forensic science laboratories are ISO 9000 and ISO 17025. The former was designed for manufacturing and concentrated on quality management, contracts and process control, although there have been some recent improvements in the move to ISO 9000:2000, making it more generic, less prescriptive and more customer focused. But the standard is still more applicable to the core management processes of the laboratory, to ensure consistent delivery of business plans and objectives, customer satisfaction and continuous improvement, than it is to casework. Assessments for registration are also carried out by quality

management specialists and provide no real examination at the technical level.

ISO 17025 evolved from ISO Guide 25, EN 45001 in Europe and NAMAS M10 in the United Kingdom. It is primarily designed for laboratories that carry out measurements. It is closely aligned with ISO 9000, and laboratories that comply with the requirements of ISO 17025 will have a quality system that also meets the requirements of ISO 9000. But ISO 17025 is wider, and more concerned with the technical activities, the fitness for purpose of the services offered, and the requirements that a laboratory needs to meet to demonstrate that it is technically competent. Assessments for accreditation are carried out by technical experts, usually recruited from peer laboratories, and the aim of the auditors is more to identify areas of risk than simply testing for compliance.

ISO 17025 covers the core technical activities of a laboratory and the management and organisational requirement to perform the activities in a competent way. It requires laboratories to have a quality manual in place and a system for the review, approval, issue and amendment of documents. It specifies the requirements for record keeping. It sets out the requirements for laboratories to co-operate with its customers, to identify its customers' needs, to ensure that the laboratory has the capability to meet those needs and to deal with complaints. It covers the sub-contracting of work and the arrangements for purchasing services and supplies. There are rules for the employment of permanent and contract staff and their training and supervision. It addresses the accommodation and environmental conditions in which the staff should work, the equipment they use, the handling of test materials, sampling, and the test and calibration methods they should employ. It makes specific reference to measurement traceability, validated methods, assuring the quality of test and calibration results and estimation of the uncertainty of measurement. It also provides specific procedures for control of non-conforming tests and calibration work, identifying the cause of problems, implementation of corrective and preventive actions, and monitoring performance after these have been implemented. And it explains how reports should be written and how opinions and interpretations should be presented.

ISO 17025 also encourages participation in appropriate proficiency testing programmes. It is important to stress that these are best viewed as management and educational tools designed primarily to help monitor how the quality systems are operating, to improve consistency and to benchmark performance against other laboratories doing similar work. Proficiency tests can also provide information about the competency of the individuals participating in the test, but it is better to treat competency testing as a separate issue.

The improved consistency arising from compliance with the international standard facilitates international exchange of data and the establishment of international databases. In these days of increased mobility of criminals and cross-border crime, the mutual recognition of test data and sharing of intelligence are considerable assets, particularly in the areas as DNA, drugs and firearms, but also to assist in the evaluation and interpretation of evidence in a wide variety of cases.

It is helpful that ISO 17025 has been specifically interpreted by the International Laboratory Accreditation Co-operation for forensic science laboratories. I am pleased to say that we were able to exert significant influence on the development of this guidance through the ENFSI Quality Assurance Working Group, and latterly the ENFSI Quality and Competence Committee, helping to ensure that it properly meets our needs.

The task of preparing a laboratory for compliance with ISO 17025 and accreditation can be quite arduous. But extensive documentation is now available and there is always the possibility of co-operation with other accredited laboratories willing to share their experiences. But there is no substitute for the laboratory doing as much of the work itself as possible. In my experience, this is where most of the learning takes place.

## COMPETENCE

Let me now turn to the issue of competence. Compliance with the international standard will ensure that the right infrastructure and framework are in place for forensic scientists to perform effectively. But it will not guarantee that they will perform effectively. It concentrates only on the quality systems required to underpin effective performance. It sets down what has to be done, not how it should be done.

So, in addition to having an effective quality management system, we have to ensure that our staff are fully able to carry out the tests, that they are competent to do so.

I should stress that being competent is not the same as being trained. Competence is based on having standards for what the person should be able to do and then assessing that they are able to work to those standards consistently in the workplace. Training is the means by which individuals are taught how to do the job to the standard required. Competence standards are best set by the profession. Training is the responsibility of employers. Assessment is best if it contains an element of independence from those providing the training.

I do not want to dwell on this further for fear of duplication what my colleague, Mike Fereday, will cover next.

## PHILOSOPY OF APPROACH

So let us now look at the third strand. Even quality systems and competent staff are not sufficient in themselves. It is also essential to have the right philosophy of approach.

First and foremost, I would hope that we would all agree that our work should be done with integrity, objectivity and impartiality, and in compliance with the requirements of the criminal justice system. Some forensic science laboratories, like the FSS, in fact include such requirements in a Code of Conduct for their staff. The Registration Council in the UK has one that is applicable to forensic scientists working in a wider range of disciplines within our criminal justice system. If written sufficiently generically, I believe we could develop a Code of Conduct that all ENFSI Member laboratories could adopt. Again, Mike Fereday will be able to say more about this.

Second, we have to meet our customers' requirements and provide our services in a fit-for-purpose way. But who is the customer for our work? Is it the police or is it the courts? The answer is both, with the emphasis towards one or the other at different times.

The primary use of forensic science in support of the police is to help identify whether a crime has been committed and to provide intelligence that will lead to the apprehension of the offender. Here, speed of response is usually paramount, and delivery of information as soon as it becomes available is the preferred approach. It is important that this information is reliable, so as not to mislead the investigation, and its strengths and limitations must be explained, but the police are not particularly concerned at this stage about its probative value or how the information is presented to them.

The courts nowadays also want cases to be dealt with quickly. It is their job to decide whether the expert evidence, together with the other evidence available, is sufficient for a decision to be reached on whether the accused person can be safely convicted of the offence charged. For this, the evidence has to be presented in the standard way prescribed by the criminal justice system. They require the expert's opinion to be balanced and impartial, and sufficiently robust to withstand challenge. They also want anything that might tend to undermine the expert's evidence to be disclosed. There is no merit in securing a conviction if it can be overturned later because of shortcomings in anything that we have, or have not, done.

So, whilst providing information to assist the investigator, we also have to bear in mind the subsequent needs of the courts. And we have to tailor our approach and outputs accordingly.

I would wholeheartedly recommend that in order to deal with these dual requirements, all forensic scientists should adopt the principles of case assessment and interpretation, which have been eloquently presented by

Evett, Jackson *et al* and their merit recognised as outstanding by ENFSI by the award that was presented to them in Cracow.

In the first instance, this is about establishing a clear understanding of what the police need to find out and ensuring that the right questions are asked and investigated. In an alleged assault case, for example, are they looking for anything to indicate who might have been involved, or to place a named suspect at the scene, or to show that the suspect was involved in a specific act rather than just being present? Each will involve different considerations. It is also important for the scientist to take account of all the other information that is available and any reasonable alternative scenarios that the laboratory findings might have to be tested against if the case comes to court. When planning and prioritising the work to be done, the scientist can then assess what is available for examination, what tests and examinations could be carried out, and the relative merits of each in providing the information required to meet the needs of the investigator and the courts.

Timely communication of developments between the police and scientist as investigations progress will then allow both to refocus and reprioritise.

When the laboratory examinations are complete, the significance of the findings has to be evaluated. For this, relevant and up to date databases are helpful, but not essential. Alternative propositions are proposed, one in line with the prosecution allegation and the other favouring the defence, and the likelihood of the laboratory findings given each proposition is assessed. Ideally, the choice of alternatives would best be carried out in consultation with the prosecutor or court at the latest possible stage, to take account of the most up to date developments in the police investigation and anything the accused person might have proffered in his defence. But this is not always possible.

I believe that this philosophy makes best use of the data produced from the laboratory tests and the competence of our scientists, for both investigator and the courts. It makes appropriate use of negative as well as positive findings, and it is invaluable in demonstrating balance and impartiality.

So let me summarise. There are three things we need to have in place. First, a quality management system to provide the right infrastructure and framework in which our scientists can work. Compliance with the requirements of ISO 17025 is the best way of achieving this and avoiding pitfalls like those in the case of the Birmingham 6. Second, competent scientists working to appropriate standards so as to avoid the "Guildford 4" criticism. And third, the right philosophy of approach to ensure that we continuously meet the requirements of both the police and the prosecutor, taking due account of all relevant considerations. This was patently missing in the Kiszko case.

It is reassuring to see that there is commitment to the first of these requirements within ENFSI. Goal 4 of the ENFSI Strategic Plan is:

"That all ENFSI laboratories comply with best practice and international standards for quality and competence".

The ENFSI Quality and Competence Committee has recommended that ENFSI go one step further and has recommended that the ENFSI Board make the following policy commitment:

"The ENFSI Board wishes to promote consistent and reliable scientific evidence through the whole forensic process from scene of incident to court. As one part of this aim it is the policy of the Board that all Member laboratories should have achieved or be taking steps towards EN ISO/EC 17025 compliant accreditation for their laboratory testing activities. In determining this policy the Board accepts that progress will be slower in some countries than others for a number of reasons, including differences in national accreditation systems and differences in the operation of legal systems.

Where EN ISO/EC 17025 compliant accreditation cannot be achieved, the Board encourages the use of other Quality Management standards with broadly equivalent objectives".

The ENFSI Quality and Competence Committee has offered to support laboratories in achieving this aim and I hope you will feel able to offer your endorsement of this policy statement at this meeting.

The Quality and Competence Committee has also devoted much time to addressing the second issue, through the Competence Assurance Project, lead by Ingvar Kopp. You will hear more about this next from Mike Fereday. Again, I hope you will feel able to offer endorsement of this work at this meeting.

I do not pretend that the third issue at this stage is anything other than an ideal towards which we should all strive. Nor should we underestimate how much time and effort will be involved in getting us there. In my own organisation, we began to set up our quality system in 1991, we have been working on competence standards for about the same length of time. But we have been making a concerted effort on implementation of the case assessment and interpretation model only for the last 5 years. And there is still a long way to go.

But a quality service will only be provided by forensic science laboratories when all three of these areas are satisfactorily addressed.