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Guidelines for a Quality Assurance Program in Forensic Anthropology

Forensic Anthropology Subcommittee
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OSAC Proposed Standard

OSAC 2025-S-0014
Guidelines for a Quality Assurance Program in Forensic Anthropology

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Abstract

A Quality Assurance (QA) program is necessary to ensure a consistent, trustworthy, and high-quality work product produced by an analyst. This document was developed to provide forensic anthropology practitioners with fundamental information on the minimal components of a quality assurance system. It is a supplement to the OSAC 2024-S-0001, *Standard for a Quality Assurance Program* in Forensic Anthropology document. The organization of the document follows that of the Standard; however, it provides explanations and examples of how the components can be implemented by sole practitioners or practitioners in unaccredited laboratories. The goal of the document is to make basic quality assurance practices available to all forensic anthropologists.

Keywords: *quality assurance, laboratory management, accreditation requirements*

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Guidelines for a Quality Assurance Program in Forensic Anthropology

Introduction

The Standard for a Quality Assurance Program in Forensic Anthropology document provides the minimal components of a Quality Assurance (QA) program for forensic anthropology laboratories. Implementing these components may be challenging for those who have not worked or trained in an accredited laboratory. This guideline document builds on the Standard requirements by illustrating how the Standard may be implemented. It is written as an example of how a laboratory's policies can address the Standard requirements. The target audience is anthropologists performing forensic casework within a larger entity that provides little to no administrative support for establishing a full quality assurance system compliant with accrediting body's requirements or international standards such as International Organization of Standardization (ISO) 17020. For example, this would include a forensic anthropologist who works within an academic department that does not recognize forensic casework as a significant aspect of its mission or scope, and which handles a limited number of cases each year. Also, it is intended for a sole practitioner who does not have the necessary infrastructure to meet an accrediting body's requirements or international standards. Laboratories that perform forensic casework on a regular basis, especially those with contracts from medicolegal authorities, are encouraged to seek formal accreditation through a certified accrediting body.

In addition to developing a QA program that includes the basic components outlined here, a forensic anthropologist should consider human and cognitive factors that impact procedures. For example, some information will never be relevant to a forensic anthropological analysis (e.g., a stakeholder's opinions about a perpetrator) and thus is considered "task irrelevant"; steps should be taken to prevent the introduction of task-irrelevant information into forensic anthropological work. Other information may be "task relevant" (e.g., knowing that the Medical Examiner suspects ballistic trauma so that this question can be explicitly addressed by the forensic anthropologist), and it shall be addressed at some point during the analysis. Task-relevant information, however, has the potential to bias an analyst if introduced prior to the completion of their analysis. Assessing what constitutes relevant versus irrelevant information is case specific with bias mitigation strategies being (to some extent) restricted when working as a sole forensic anthropologist or in a smaller team. However, considerations of procedures on how to optimize information sequencing and promote transparency in forensic anthropology data collection, analysis, and interpretation should be taken. For example, this could be done by implementing guidelines that document the procedure and sequence of information in terms of assessing what information is available (e.g., case materials, photos from scene and autopsies, investigative summaries), what information is needed for the forensic anthropologist to conduct their analysis, (task-relevant information vs task-irrelevant information) and what information can be received at a later stage (post analysis) to minimize the risk of cognitive biases. Larger laboratories with multiple practitioners might benefit from assigning different individuals to different tasks to

minimize potential contextually biasing information, specifically in complex cases where the risk of bias might be greater. This could be done by ensuring that the person taking part in the recovery does not perform the analysis, allowing the analyst to be blind to contextual information. Although this might be challenging for a sole practitioner, blind peer review can be implemented by sending case photographs prior to sending case information (e.g., analytical report, bench notes, diagrams, police reports) so that a remote reviewer has an opportunity to conduct an independent assessment (see section 4.14).

Forensic anthropologists may use the resources referenced in this document as well as the Standard as a first step to mitigate the influence of human and cognitive factors to the best of their ability.

Appendix A is a diagram to assist with understanding the relationship between standards, accreditation, and QA programs.

4.1 Requirements

Identifying and documenting the scope of work, i.e., what analyses and services (tasks) a forensic anthropology laboratory provides, is the first step in developing a QA program. Examples of analyses are generating a biological profile, skeletal trauma analysis, histological examinations, and antemortem/postmortem radiograph comparison. Services may include search and recovery of evidence from a scene. The scope of work is the foundation of the QA program. All standard operating procedures, training modules, and competency and proficiency testing are centered on tasks provided. A laboratory can expand the list of tasks but will have to ensure that these tasks meet all the relevant requirements of the QA program. Laboratories should not perform *ad hoc* tasks without appropriate standard operating procedures, training, and competency testing.

4.2 Organization

The internal organization and chain of command may be highly variable depending on the setting of the laboratory, but includes all individuals (e.g., authorized personnel, students, volunteers) that perform tasks. For example, in an academic setting, the organization of the laboratory may require an undergraduate intern to report to an attending graduate student who, in turn, reports to the faculty laboratory director. A sole practitioner may document that they report facility concerns to the facilities manager and case concerns to the requesting agency, such as a law enforcement agency, medicolegal authority, district attorney, or defense counsel.

4.3 Safety

An appropriate health and safety program can be as simple or elaborate as needed, depending on the tasks performed by the forensic anthropology laboratory. The purpose of the program is to reduce and mitigate any potential hazards encountered during casework, whether in the

laboratory or during remote operations. For example, regarding the use of appropriate personal protective equipment (PPE), a laboratory's safety program may address how to appropriately don and doff the PPE to prevent transmission of bloodborne and airborne pathogens during examinations. This program may also address safety in the use of autopsy/scene tools, handling of biohazardous chemicals and biological tissues, and establishing safety procedures.

4.4 Security

The laboratory's security policy typically addresses physical and digital evidence, case files (hard-copies and electronic), and building/facility access. The security of physical evidence is ensured at all stages of the process including receipt, transportation, transfer, analysis, storage, and disposition. Transport of human remains is secured so that only authorized individuals have access to the transporting vehicle. Consider if written permission is needed to transport human remains from a scene to a laboratory; if so, written procedures are developed to address appropriate documentation and necessary signatures.

Laboratory access is limited to authorized personnel, and the laboratory manager maintains documentation of individuals who have authorized access. Access may be restricted by key cards, physical keys, or other security devices. Doors to the laboratory should always remain secured. Some laboratories also utilize surveillance cameras around (inside and outside) the facility. Controlled access may be granted to visitors. A visitor log or similar is used to document who has entered the laboratory, the date and time of the visit, and which authorized person escorted the visitor or provided access. The security policy also addresses photographs taken inside the laboratory and by whom.

Laboratory policies address access to both electronic and paper case files. A secure computer system can be used to control access to electronic case files. Paper case files can be secured using a locking cabinet or a locked room accessible solely to authorized personnel, and all access events are logged.

4.5 Document Control

Documents that dictate how the laboratory performs tasks (e.g., standard operating procedures [SOPs]) as well as standardized forms used to collect information (e.g., bench notes, chain of custody) are controlled. Current versions of a document are clearly marked and readily available to authorized personnel; obsolete versions of a document are clearly marked and may not be available to authorized personnel. The current version of a document is kept in a controlled location (e.g., a properly labeled binder or electronic file). When copies are made of the controlled document (e.g., photocopy of a document held within the controlled binder or printed copy of the document from the controlled electronic file), it is marked as 'uncontrolled'.

There are several ways to create a document-control system through properly labeled and secured files. Commercial software is available as well. For reference, SOPs from some accredited

laboratories can be accessed online (Appendix C); these are marked with their effective dates for clear recognition of the most current version.

4.6 Standard Operating Procedures (SOPs)

A SOP is a document which describes the regularly recurring operations in a workplace. The goal of the documents is to ensure consistency among authorized personnel that perform each task. These documents cover the full range of the laboratory's operations including receiving evidence, accessioning evidence, analyzing evidence, writing analytical reports, technical and administrative review, transferring evidence, and disposition of evidence. Tasks are performed in compliance with the SOP to ensure standardization. This may include tasks that are performed at locations away from the laboratory.

When an analyst deviates from a laboratory SOP, the deviation(s), the detailed reasoning for the deviation(s), the justification for the proposed alternative procedure or process, and the authorization(s) are documented in the case file. When possible (and if appropriate), a planned departure from a procedure or process is pre-approved and documented by laboratory management. Additionally (when possible), the requesting agency is notified of potential deviations prior to their occurrence. The laboratory should foster open discussion with the requesting agency regarding potential deviations. Prior to conducting additional (destructive) testing, the laboratory obtains consent/authorization from the requesting agency, especially if the evidentiary material/remains will be entirely consumed or chemically, thermally, or structurally altered.

Some accredited forensic anthropology laboratories publish their SOPs online (see Appendix C); these serve as helpful resources as a laboratory develops its own SOPs. Standards published by accredited Standard Development Organizations such as the Academy Standards Board (ASB) can serve as a basis or component of an SOP. For example, a SOP for skeletal analysis may reference the American National Standards Institute (ANSI)/ASB standards for age, sex, population affinity, and stature estimation.

4.7 Method Development and Validation

Most forensic anthropologists use methods that have been validated for use under a wide range of typical operating conditions with a wide range of samples and published in peer reviewed journals. Most of these methods are not sensitive to laboratory conditions and do not need to be internally validated before use unless the operating procedures are outside of those covered in the published validation reports, or the method is used on samples (populations) different from the one used to develop the method. In some situations, methods may need to be modified or developed by the laboratory. In these situations, the method development or modification is done with a documented plan, and the experiment/study is carried out with known samples by competent personnel. All records associated with method development and validation are retained to show the scientific validity and reliability of the method.

Some elements to be considered, as applicable, when performing method validation include: accuracy and reliability of measurements, repeatability, reproducibility, bias, precision, and method limitations. Methods need to be validated when they have not been peer-reviewed/published, have been modified, or are being used outside of the intended purpose. If the modification(s) are significant enough to depart from the original validated method and/or the result, the method should be re-validated. These modifications can include changes to the technical procedures, statistical analyses, and/or representative samples.

4.8 Accuracy and Reliability of Measurement and Observation

Instruments, equipment, and reference materials may be damaged during routine handling and become unreliable. Calibration and performance checks ensure that instruments, equipment, and reference materials are functioning properly and are in good repair.

Typically, instrument calibration is performed by an external calibration service provider that is certified to ISO 17025 and a certificate of calibration is received following a calibration test.

Performance checks are performed within the laboratory by measuring an item of known dimension (i.e., gage block) and are done at regularly scheduled intervals.

Calibration and maintenance of equipment may require regular service by a certified technician; such is the case with microscopes and medical imaging equipment. More specialized equipment such as a digitizer may require the authorized personnel to work directly with the manufacturer.

Comparative materials, such as pubic symphysis casts, are inspected for damage or deterioration. One possible way to evaluate wear and tear is to photograph an item when it is received and then compare the item to the original photograph at established intervals (e.g., annually, semi-annually). The initial photograph creates a record of the object's original appearance and allows the authorized personnel to note any physical change in the item.

Calibration and performance checks of instruments, equipment and reference materials are done at established, regular intervals; for example, calibration scheduled annually, and performance checks scheduled quarterly. The calibration certificates and performance checks (i.e., logbook and associated records) are maintained/archived. Individual instruments, equipment, and comparative materials are given a unique identifier so that they can be properly identified in calibration certificates and logbooks.

For many forensic science disciplines, extreme accuracy of measurement results and metrological traceability (e.g., a documented and unbroken chain of calibrations to specified national or international reference measurement standards) are required. However, critical measurements and extreme accuracy of measurements (e.g., hundredths of a millimeter or smaller) are not required in forensic anthropology because common statistical programs (e.g., Fordisc) typically require whole-number data and in many cases, measurements are used primarily as descriptors.

Laboratory policy determines what level of variation is acceptable to scientifically support conclusions/interpretations and sets the appropriate tolerance levels for equipment. If an item's performance falls outside the tolerated range (i.e., does not pass a calibration test and/or performance check), it is removed from service, labeled as such, and documented in laboratory management records.

4.9 Personnel

All individuals (i.e., authorized personnel, students, interns, volunteers) handling evidence and/or performing laboratory tasks must be adequately trained before working independently, regardless of the tasks being performed. Furthermore, the required education and training required to perform a task are identified and documented in the laboratory's policies and SOPs. A record of education and training is created and maintained for each individual authorized to perform each task. With each additional education and training activity an individual receives, their record is updated. Some jurisdictions may require laboratories to provide access to these records. Having a list of authorized individuals can help manage records of individuals who have left the laboratory.

4.10 Training

A training program ensures that laboratory personnel have learned the necessary protocols, skills, and techniques to carry out the laboratory's scope of work. The training program may include topics such as laboratory security and safety, evidence handling, cognitive bias and human factors (see Appendix B and C for resources to facilitate human factors training), method validation, and other laboratory-specific topics. Testing demonstrates understanding and mastery of the training.

4.11 Competency and Proficiency Testing

Competency tests provide a means to gauge an individual's ability to function independently in a laboratory. Ideally, new laboratory personnel who have the potential to handle casework or perform analyses are competency tested prior to beginning casework. Using the laboratory's defined list of areas that require testing (e.g., sex estimation, age estimation, population affinity estimation, human/non-human differentiation), all new personnel are administered tests (that include a practical component) related to their duties prior to working on casework.

Proficiency testing occurs at regular intervals to evaluate participants' capabilities, performance, and overall laboratory practices. A laboratory completes at least one proficiency test per year but can administer more than one per year, if desired. Not every task needs to be tested annually; the laboratory will determine the testing schedule. Proficiency tests are analyses that mimic casework, but the results are known by those administering the tests. Due to the large amount of variation in the human body, forensic anthropology proficiency test answers may be consensus-based. For example, the pubic symphysis of a White 38-year-old male provided for a proficiency test is presented. Using the Hartnett (2010) phase-based method for aging pubic

symphyses in males, an analyst scores the bone as a Phase 5 (range of 37 years to 72 years). Looking at the age ranges of the phases, a 38-year old male would fall in Phase 3, Phase 4, and Phase 5. Knowing the chronological age of the individual does not offer a benefit when proficiency testing for this anthropological analysis. Instead, the bone should be submitted to multiple experts to provide a consensus on the specific phase that best represents the morphology of the specimen being examined. If the experts evaluated the bone and agreed that the morphology was best described as Phase 5, then the analyst's answer would be correct. If the experts agreed that the morphology was best described as Phase 3, then the analyst would be incorrect.

Proficiency testing may also be used to test if the laboratory's process/procedure is working correctly. For example, a pig femur is presented to a laboratory's analyst. The analyst evaluates the pig femur and concludes it is a human bone. The laboratory's procedure is to conduct a technical review of all casework. Prior to finalization of the report, a second qualified analyst examines the bone and determines it is of non-human origin; they review the case analyst's findings and initiate a discussion with the case analyst to determine if an agreement on the findings (human vs. non-human) is achievable. After discussion, the case analyst revises their findings to report the bone is of non-human origin. Although the case analyst did not make the "correct" determination initially, the laboratory's process worked because the final opinion (after review and discussion) was "correct."

To be most effective, proficiency tests should be conducted in the blind. During blind proficiency testing the analyst does not know they are being tested, allowing the test environment to closely mirror typical casework. Blind proficiency testing is difficult in anthropology due to the nature of the evidence. However, if a laboratory performs human/non-human comparisons based on photographs submitted electronically, the laboratory could have a law enforcement agent submit a proficiency test that consists of a photograph of a bone. The analyst would be unaware that they are taking a proficiency test and would complete the analysis in a true analytical environment. Blind proficiency testing, however, may not be feasible for all tasks in the laboratory's scope of work. If non-blinded proficiency tests are used, the laboratory should document why this option was used instead of (preferred) blind proficiency testing.

See Appendix C for resources on proficiency test implementation strategies. External vendors are available to provide a limited selection of proficiency tests for forensic anthropology laboratories for a fee. Each proficiency test typically addresses one examination area (e.g., sex estimation) per test. A documented plan/schedule of what tasks are proficiency-tested and when it is strongly recommended to reduce the chances of missing proficiency-testing of specific tasks. When the result of a proficiency test does not match the expected result and is not scientifically justifiable, an analysis of the source of the error is done and documented. When necessary, the analyst is retrained and retested before returning to performing independent analysis and/or the laboratory's insufficient process/procedure is amended.

Results of the competency and proficiency tests and any follow-up action such as retraining are archived.

4.12 Evidence Handling

Evidence-handling procedures include how evidence is received and accessioned. All human remains are treated as evidentiary material. Accessioning includes assigning a unique identifier (i.e., case number) to each case. At times, additional remains may be received for a case already accessioned into the laboratory. When this occurs, the original unique identifier can be assigned to the additional remains, but the secondary accessioning is documented in the case file.

The written procedure addresses steps to protect against commingling and contamination. These steps can be as simple as allowing only one case to be placed on a table or tray at a time. A laboratory may choose to write the unique identifier on each bone of a case or may choose to label the container holding the remains with the unique identifier. The system that a laboratory employs to label a case with a unique identifier is included in the written procedure.

The written procedure includes documentation of evidence transfers (i.e., appropriately signed chain of custody). The documentation is initiated when evidence is first received–whether as a recovery from the scene or through transfer from the requesting agency–and continues until final disposition of the evidence. Evidence transfer is typically documented on a form and the form (or copy of it) is stored in the case file. If samples are removed from the submitted evidence, they are given unique identifiers as well and these identifiers allow tracing the samples back to the submitted evidence.

The written procedure includes the final disposition of the evidence. Final disposition may be to return the evidence to the requesting agency, to archive evidence for a specific period then destroy it, or to archive evidence indefinitely. Regardless of the final disposition chosen, it is communicated to the requesting agency and documented.

4.13 Case File

The composition of the case file (i.e., case report, photographs, and other documents) is retained per the laboratory's written policy or SOP for document retention. The case file and all documents held within it are labeled with the unique identifier assigned to the evidence. The case file includes all forms used to track evidence (receipt, transfer, release, or final disposition), documents pertaining to the task (e.g., police report, medical examiner report), documents created during the task (e.g., site map, bench notes, analysis printouts, final report), and all communications regarding the case (e.g., copy of emails, written documentation of phone calls, expert witness testimony documents). Items such as radiographs and photographs may be kept in a separate location (e.g., designated server), but must be associated with the case file (typically accomplished by labeling each item with the unique identifier) and retrievable. If items are stored separately from the case file, their alternate storage location(s) is documented in the policy or SOP.

4.14 Technical and Administrative Review

Technical review is an independent evaluation of a case file by a qualified forensic anthropologist. The goal of the technical review is to ensure that:

a) The methods used during the analysis are appropriate and followed correctly,
b) The evidence is adequately documented (e.g., photographs, radiographs),
c) All items are properly marked with the unique case identifier,
d) The bench notes are clear and complete,
e) The reported results/findings/opinions are accurate, reasonable, clearly stated, and supported by the technical record,
f) The final report is clearly written, and
g) Proper technical procedures were followed and, when possible, that the laboratory's policies and procedures were adhered to.

Technical reviews may not be performed by individuals involved in the examination or reporting of the case and may be done internally or externally. Technical review is not required for 100% of cases produced by a laboratory, but a laboratory defines parameters for cases that require technical review if 100% is not met. The technical review is documented (typically on a form) and that documentation is retained in the case file. A formal agreement between agencies may be required prior to providing external technical review. The agreement may include an expected turnaround time for a review and how to handle discordance. When a discordance occurs and cannot be settled between the analyst and reviewer, another expert is consulted. Note that a reviewer may be subpoenaed to discuss their role in the case and their opinion of the analysis.

Administrative review is usually conducted by an individual familiar with the laboratory's reporting format. During the administrative review, the final report and supporting documentation is checked for the laboratory's standard report format and accuracy of basic case information such as case number, spelling of decedent's name, dates, initials, page number, presence of signature, etc. The technical and administrative reviews may be conducted by the same individual. For sole practitioners who are unable to find peers to perform the technical reviews, some forensic anthropology professional organizations have available review networks to assist.

4.15 Risk Management

Preventive actions are taken to reduce the opportunities for nonconformances or unexpected/undesirable events from occurring. Risk assessments are assessments of potential issues that could create undesirable events. Risk assessments can result in preventive actions being taken to reduce the risk and/or prevent an event from occurring. These are typically documented using the following: identified risk, evaluation of risk, preventive actions to address risk, and monitoring of effectiveness of actions taken. Together, these processes allow for improvement in the quality of work in a laboratory while reducing any negative impacts.

For example, the laboratory manager notices that only the lids of specimen jars are labeled with the case number. The manager is concerned that if the lids are switched (which is easy to do),

then the cases would be incorrectly labeled (identification of risk). The manager performs a risk assessment by reviewing the Evidence Management SOP. The SOP states to "label the jar" and is not specific as to what part of the jar should be labeled (evaluation of risk). The manager revises the SOP to state that the jar itself should be labeled, regardless of whether the lid is labeled. The manager distributes the updated SOP to all authorized personnel and provides training (preventive action to address risk). The manager monitors the labeling of the specimen jars for a period to ensure that all authorized personnel are following the revised procedure (monitoring of effectiveness).

A corrective action follows the identification of a nonconformance. A nonconformance occurs when work is performed that does not follow the laboratory's own policies/procedures, implemented good laboratory practices, or implemented published standards. When a nonconformance is discovered, a corrective action is taken. The procedures for handling nonconformances should include the following:

a) identify affected case(s) and sample(s),

b) identify potential impact on the case(s) and sample(s),

d) perform a cause analysis (i.e., systematic approach used to identify the underlying cause(s) of a problem to find appropriate solutions that go beyond just addressing the symptoms of the problem),

e) investigate to determine if incident is systemic,

f) create a corrective action plan,

g) monitor for effectiveness of the corrective action,

h) notify relevant stakeholders, if applicable.

Building on the previous example, an analyst at the laboratory has labeled the lids of specimen jars and not the jars themselves. A colleague notices this and notifies the laboratory manager about the nonconformance as this is in violation of the newly revised Evidence Management SOP. The laboratory manager performs a cause analysis by interviewing the analyst, reviewing the analyst's training record, re-reviewing the SOP to see if there are any deficiencies, examining other specimen jars handled by the analyst as well as specimen jars handled by other analysts. The manager determines that the analyst received the original training, the SOP is clearly written, and other analysts are properly labeling specimen jars. The manager determines that this is a problem affecting one analyst and not a systemic problem. The manager also determines that the analyst has not been following the revised SOP, but it is unlikely that they have switched labeled lids, and no casework has been negatively affected. The manager creates a corrective action plan for the analyst which involves re-reading the SOP and taking a short quiz. Then, the analyst's specimen jars are monitored for a specific period to ensure that the SOP is followed correctly.

All events of the nonconformance and corrective action are documented to include a description of the nonconformity, list of specimens/cases affected, outcome of the cause analysis, necessary corrective actions, and monitoring period and results. A laboratory may consider adding this

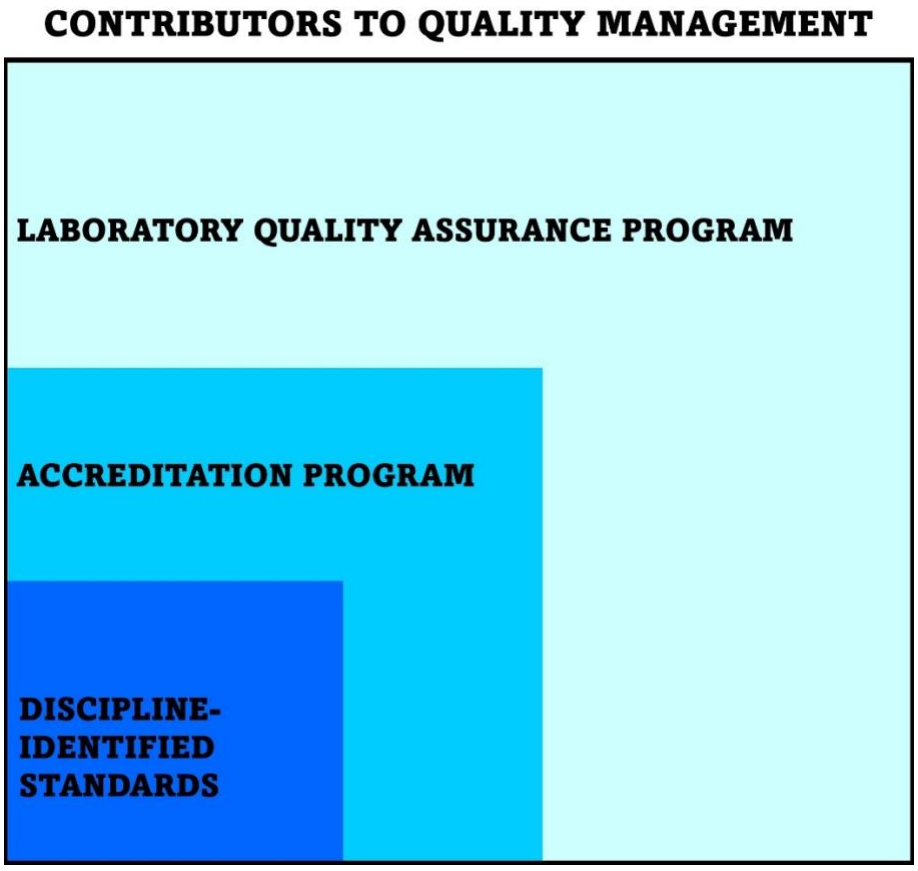
documentation to the case files of affected cases. This record is retained for a defined period based on the documented retention schedule. Some corrective actions may be minor like the above example; some may be major, requiring work to be suspended, retracted, or re-done as necessary.

Some accredited laboratories post their corrective action SOP on their website, and these can serve as resources (See Appendix C).

4.16 Impartiality

Impartiality and ethics are extremely important in forensics. The forensic anthropology laboratory shall adhere to a documented ethics policy and code of conduct. Key concepts that should be addressed include the following: 1) accurately representing one's credentials and practicing within the limits of one's professional expertise; 2) preparing reports and providing testimony that are clear and objective; and 3) avoiding bias, influence, and conflicts of interest. The United States Department of Justice published a national code of professional responsibility for forensic science service providers that may serve as a resource for drafting an ethics policy or be adopted by forensic anthropology laboratories (See Appendix C).

Appendix A



This diagram demonstrates the relationship between discipline consensus standards (i.e., OSAC and ANSI/ASB), accreditation program requirements (e.g., ISO 17020), and the laboratory Quality Assurance program. Discipline consensus standards are narrowly focused, typically on a single task (e.g., estimating sex from skeletal remains; determination of medicolegal significance). However, they tend to be very general and provide the most basic consensus-based requirements. Practitioners can follow them with current resources. Accreditation program requirements are broader in focus but more specific in content. They provide guidance on what elements are needed for a laboratory to create an efficient and rigorous Quality Assurance program. Being accredited encourages public trust in the quality of products produced by a laboratory. The laboratory Quality Assurance program is the broadest in its focus but the most specific in the guidance that it provides; it effectively dictates how a laboratory operates. Although these three levels are not contingent on each other, they can help inform the other levels.

Appendix B

Table of Relevant References with Recommendations for Bias Mitigation

While little published research has tested the efficacy of proposed bias-mitigation strategies, many helpful suggestions exist. They are summarized below.

Reference	Application to QA	Recommendations
Cooper & Meterko (2019)	Training, SOPs	Reduce access to task irrelevant information, multiple comparison samples, blind analysis
Davidson, Nakhaeizadeh & Rando (2023)	Training, SOPs	Adapt SOPs to reflect possible biases due to the order of examination
Dror & Kukucka (2021)	Training, SOPs	Linear Sequential Unmasking - Expanded (LSU-E)
Goots, Hefner, & Start (2023)	Training, SOPs	Peer review, SOPs, synthesizing data from multiple elements
Hartley, Winburn, & Dror (2022)	Training, SOPs	Use of statistical frameworks to synthesize data from multiple elements, blind analysis, LSU-E, documenting decision making process,
Kassin, Dror, & Kukucka (2013)	Training, SOPs, Technical and Administrative Reviews	Sequence of examination: document evidence findings prior to comparison with target, blind testing, peer review, bias training.
Kunkler & Roy (2023)	Training, Method Development and Validation, SOPs	Use validated, standardized methods, transparency in documenting analysis, document evidence findings prior to comparison with target, masking biasing information, blind testing.
Meija, Cuellar, & Salyards (2020)	Competency and Proficiency Training	Blind proficiency testing
Nakhaeizadeh, Dror, & Morgan (2020)	Method Development and Applications	Assessing what information is task relevant for specific methods.
Nakhaeizadeh, Dror & Morgan (2014)	Training, SOPs	Blind testing, case management
Nakhaeizadeh, Hanson & Dozzi (2014)	Training, Method Development and Validation	Training, blind testing, method assessment
Nakhaeizadeh, et al (2018)	Training, SOPs	Blind testing, separate individuals for evidence recovery and analysis
Quigley-McBride et al (2022)	Training, SOPs	Linear Sequential Unmasking – Expanded (LSU-E)
Sauerwein (2018)	Training, SOPs, Method Development and Validation	Use of method appropriate to sample and context, separate individuals for donor placement and data collection, development of more objective methods for decomposition analysis
Spellman, Eldridge & Bieber (2022)	Training, SOPs, Technical and Administrative Reviews	Separate individuals for evidence recovery and analysis, document evidence findings prior to comparison with target, blind testing, peer review.
Warren, Friend, & Stock (2018)	Training, method development and validation	Method assessment, blind peer review, sequential unmasking of information.
Winburn (2018)	Training, quality control	Understand and constrain errors with strong methods and quality control

Appendix C

Informative References

1] The New York City Office of the Chief Medical Anthropology Unit's Technical Manuals can be accessed at https://www.nyc.gov/site/ocme/services/forensic-anthropology-unit-technical-manuals.page.

2] The New York City Office of the Chief Medical Anthropology Unit's Laboratory Analysis Manual can be accessed at https://www.nyc.gov/site/ocme/services/fau-anthropological-laboratory-analysis-manual.page.

3] Arkansas State Crime Laboratory Quality Manual can be accessed at https://www.dps.arkansas.gov/wp-content/uploads/2020/07/ASCL-DOC-01-Quality-Manual-1709-22.pdf.

4] Cooper GS, Meterko V. 2019. Cognitive bias research in forensic science: A systematic review. *Forensic Science International*, 297: 35-46. doi: 10.1016/j.forsciint.2019.01.016.

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