

American Dental Association
Technical Report No. 1088

Human Identification by Comparative Dental Analysis

ADA American
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Standards Committee on Dental Informatics

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AMERICAN DENTAL ASSOCIATION TECHNICAL REPORT NO. 1088 FOR HUMAN IDENTIFICATION BY COMPARATIVE DENTAL ANALYSIS

The ADA Standards Committee on Dental Informatics (SCDI) has approved American Dental Association Technical Report No. 1088 for Human Identification by Comparative Dental Analysis. Working Groups of the ADA SCDI formulate this and other specifications and technical reports for the application of information technology and other electronic technologies to dentistry's clinical and administrative operations. The ADA SCDI has representation from appropriate interests in the United States in the standardization of information technology and other electronic technologies used in dental practice. The ADA SCDI confirmed approval of ADA Technical Report No. 1088 on January 26, 2017.

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AMERICAN DENTAL ASSOCIATION TECHNICAL REPORT NO. 1088 FOR HUMAN IDENTIFICATION BY COMPARATIVE DENTAL ANALYSIS

FOREWORD

(This Foreword does not form a part of ADA Technical Report No. 1088 for Human Identification by Comparative Dental Analysis).

In 1992, there was interest in the standardization of clinical information systems related to electronic technology in the dental environment. After evaluating current informatics activities, a Task Group of the ANSI Accredited Standards Committee MD156 (ASC MD156) was created by the ADA to initiate the development of technical reports, guidelines, and standards on electronic technologies used in dental practice. In 1999, the ADA established the ADA Standards Committee on Dental Informatics (SCDI). The ADA SCDI is currently the group that reviews and approves proposed American National Standards (ANSI approved) and technical reports developed by the standards committee's working groups. The ADA became an ANSI accredited standards organization in 2000.

The scope of the ADA SCDI is:

"The ADA SCDI shall develop informatics standards, technical reports and guidelines and interact with other entities involved in the development of health informatics standards aimed at implementation across the dental profession."

AMERICAN DENTAL ASSOCIATION TECHNICAL REPORT NO. 1088 FOR HUMAN IDENTIFICATION BY COMPARATIVE DENTAL ANALYSIS

INTRODUCTION

The establishment of a positive identification of unknown human remains or an unidentified living individual by comparative dental analysis requires both the submission of supporting documentation from the dental provider (s) who treated the patient as well as careful documentation of the unidentified remains or an unidentified living individual. Human Identification by dental analysis is the comparison of oral maxillofacial structures. The procedures to reconcile this information (e.g., radiographs, charts, and progress notes) have been outlined by numerous forensic organizations including the American Board of Forensic Odontology (ABFO), American Society of Forensic Odontology (ASFO), British Association of Forensic Odontology (BAFO), Disaster Mortuary Operational Response Team (DMORT), Interpol's DVI Steering Committee Forensic Odontology Subcommittee as well as many others.

The goal of this technical report is to provide the best available current information to forensic odontologists, forensic pathologists, medical examiners and coroners, law enforcement personnel, dental schools, emergency planners and others on the best practices recommended by the forensic odontology community. It includes guidelines on how to obtain comparative forensic dental data as well as the recommended methodologies to reconcile that data in order to establish an identification by comparative dental analysis.

1 BACKGROUND

In the United States, the identification of unidentified living individuals is the responsibility of local, state or federal law enforcement agencies. The Medical Examiner or Coroner (ME/C) has the statutory responsibility and judicial authority to identify the deceased. Although it is ultimately these agencies that certify the identification it is the responsibility of the forensic odontologist to provide their opinion on the identity as it relates to forensic odontology. Those opinions are based on a standardized set of guidelines established by the forensic odontology community and are based on scientific best practices.

The positive identification of an individual is of critical importance for multiple reasons that include:

For unidentified living individuals:

- A positive identification is vital to reunite an unidentified living individual with their family members.

For the human remains:

A positive identification is vital to help family members progress through the grieving process, providing some sense of relief in knowing that their loved one has been found.

- A positive identification and subsequent death certificate is necessary in order to settle business and personal affairs.
Disbursement of life insurance proceeds, estate transfer, settlement of probate, and execution of wills, remarriage of spouse and child custody issues can be delayed for years by legal proceedings if a positive identification cannot be rendered.
Criminal investigation and potential prosecution in a homicide case may not proceed without a positive identification of the victim.

Since the consequences of a misidentification can have emotional and legal ramifications the use of other identification modalities include ridgeology, DNA, or other scientific methods of identification (see Section 6 Scientific Methods Of Identification below) should be considered especially if there is any ambiguity in the comparative dental analysis.

2 RATIONALE

Forensic odontologists are responsible for identifying unknown human individuals by comparative dental analysis. This process requires comprehensive collection and processing of dental data in order to prove or disprove a human identification. The goal of this technical report is to establish current best practices for this process based on the most up to date technology. The intent of this technical report is not to supersede local, state, or federal jurisdictional guidelines but serve as a tool for the development of those guidelines.

3 SCOPE

The scope of this technical report is to develop a recommend set of guidelines for the process of identifying humans by comparative dental analysis. A goal of this technical report is to create awareness and education for the dental practitioner on the forensic odontology identification process as well as understand what information may be required should the need for them to participate occurs.

4 NORMATIVE REFERENCES

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1942 Dentistry – Vocabulary

ISO 3950, Dentistry — Designation system for teeth and areas of the oral cavity

ANSI/ADA 1058-2010, Forensic Dental Data Set

(ANSI/ADA standards and ISO standards for dentistry are available from the American Dental Association, Standards Department, 211 E. Chicago Ave., Chicago, IL 60611 or www.adacatalog.org).

ANSI-NIST ITL 1-2011 Update 2015 NIST Special Publication 500-290 Rev2 (2015)

(NIST publications are available from www.nist.gov)

ASTM E1732 – 12 Standard Terminology Relating to Forensic Science

ASTM E1459 – 13 Standard Guide for Physical Evidence Labeling and Related Documentation

ASTM E1188 – 11 Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator

ASTM E678 - 07(2013) Standard Practice for Evaluation of Scientific or Technical Data

ASTM E620 – 11 Standard Practice for Reporting Opinions of Scientific or Technical Experts

(ASTM Standards are available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428 or www.astm.org).

HIPPA 45 CFR (Code of Federal Regulations)

(The HIPAA regulation is available from <http://www.hhs.gov/hipaa/>).

5 CONVENTIONS USED IN THIS DOCUMENT

The term **dental provider** will refer to any individual who can legally provide the services requested. In addition, whenever forensic odontological services are required the dental provider must have additional forensic odontological training and skills to provide a legally recognized competent medical opinion concerning the comparative dental analysis. The credentialing of individuals is beyond the scope of this document.

Dental identification involves comparing 'prior dental data' to the available dental data of the remains or unknown individual in his/her current state. The term **prior data** refers to data collected when that individual was in a previous known and documented state/condition and does not mean a specific point in time. The term **current data** refers to the available data for the individual or remains in his/her current state. For disaster victim identification and unknown deceased identification prior data is referred to as antemortem (pre death) data while the current data is referred to as postmortem (post death) data. For a person unable (or unwilling) to identify themselves the data is simply referred to as prior dental data and current dental data both of which are technically antemortem data.

Since the focus of this Technical Report is on identification of the deceased, for the sake of simplicity, the term **antemortem dental data** will be utilized to refer to historical dental data collected by an independent third party, typically a dental professional, regardless of whether that individual is currently alive or deceased. Typically, this individual has been reported missing to a law enforcement agency and the whereabouts of the individual is unknown. The use of this term in this document could also refer to historical dental data of an unidentified living individual.

The term **postmortem dental data** will refer to the current dental data collected by a representative of the ME/C, typically a dental professional, of a disaster victim or an unknown deceased individual. While, by definition, there would be no "postmortem dental data" for an unidentified living individual the "current dental data" serves the same function as "postmortem dental data."

The terms **remains** and **decedent** will refer to the unknown individual whose identity needs to be established by comparative dental analysis. Therefore, the use of these terms in this document could also refer to an unidentified living individual.

It is beyond the scope of this document to include specific procedural methods or techniques.

5.1 Visual

A non-scientific method is often used when there is little doubt who the individual is, when the remains are not decomposed, and/or the death was witnessed. However, changes in appearance from illness, the circumstances of death, (fire, trauma, disintegration, etc.) and postmortem taphonomic effects, (decomposition, mummification, saponification, skeletonization, animal predation/scavenging, insect activity, etc.), may render it unreliable.

Tattoos, scars, piercings, subdermal body modification, and soft tissue abnormalities are useful for visual identification, especially if the tissue is intact. It is important to note, that, although personal effects are often found with the remains or at the scene (identification cards, jewelry, cell phones, etc.), they should never be used as the sole means of establishing an identification due to the possibility that these items were exchanged between individuals. However, they may offer important clues for a presumptive identification and assist in obtaining antemortem data on the individual to allow for a scientific identification.

In the future, the potential to establish a large facial image database based on facial recognition data may be possible; however, currently, these databases are extremely limited in size. However, even these limited databases could be utilized to establish a presumptive identification and could assist in obtaining antemortem information in order to establish a more scientific basis of identification.

5.2 Ridgeology (Fingerprints, palm and footprints)

Ridgeology is an expedient biometric method of human identification, especially if the soft tissue of the fingers are intact, an adequate impression or image of the friction ridges can be obtained, and antemortem fingerprint records are available. Burned, decomposed, skeletonized and fragmented remains may be more difficult, if not impossible, to image, however, newer techniques have reduced this problem. This method has the advantage of large known national and international databases and does not required a presumptive identification in order to obtain antemortem information.

5.3 Anthropology/Radiology

Anthropology, combined with radiology relies on the unique characteristics of the skeleton to compare with antemortem medical imaging and records. Radiographs of skeletal anatomy, bony anomalies, healed fractures, pathological lesions, medical/surgical hardware and implants, or unusual qualities of the skeleton can be used to confirm identification. However, many individuals do not have antemortem skeletal imaging, or the images may not be available. However, the biometric uniqueness of a pathological condition or image of an implanted medical device (unless a serial number of an implanted device exists,) may be questioned.

5.4 DNA

Like other biometric methods of identification, DNA comparison relies on access to antemortem data to make a definitive identification. However, unlike other modalities, familial relationship can be established even when antemortem data is not available. In addition, like ridgeology (fingerprints) large national databases are currently being established that can reduce the need for a presumptive identification especially if the decedent has had contact with the justice system. Direct primary and secondary reference samples from the decedent during life are the best sources for identification and indirect DNA reference samples from biological relatives can prove useful in establishing a relationship. DNA testing requires more time, effort, specialized personnel/equipment, and higher cost than other identification methods. The majority of forensic DNA tests are performed on nuclear DNA using polymerase chain reaction (PCR) amplification of the sample with short tandem repeat (STR) typing. Simultaneous analysis of mitochondrial DNA (mtDNA) may be necessary in order to improve the identification process. Forensic DNA analyses for human identification has seen a tremendous implementation since the President's DNA Initiative Program began in 2003. This program has facilitated funding, training, and assistance to ensure forensic DNA reaches its full potential to identify missing persons. From this program, the National Institute of Justice now provides funding to have DNA analysis done on unidentified remains and family reference samples, at no cost, by the Center for Human Identification at the University of North Texas, or by the FBI. Once the analysis is complete, the profiles (if they qualify) are entered into the FBI's CODIS system (Combined DNA Index System) and uploaded into the National DNA Index System.

5.5 Dental

Comparative dental analysis of human remains is one of the most common, and often, the most expedient and efficacious biometric method for identifying burned, decomposed, skeletonized and fragmented remains. This method involves the comparison of antemortem dental information to postmortem dental information, typically

based on radiographs but also with written records, three-dimensional models, as well as intraoral and extraoral photographs of the decedent.

6 DENTAL IDENTIFICATION

Dental identification of a deceased person is a primary function of forensic odontology. The comparison of a missing person's antemortem dental records/evidence (i.e., written records, study casts, photographs/digital images and radiographs) with the postmortem dental evidence from unknown human remains has long been recognized as one of the most reliable means of positive scientific identification.

7 TYPES OF DENTAL INFORMATION

7.1 Oral and Dental Record

In the case of a missing person, a dental record includes all the historical data including the complete clinical, radiographic and photographic examination of the oral cavity (see Section 9 Collection And Preservation Of Antemortem Dental Evidence below). In the case of a decedent or unidentified living individual, the current examination should include the same information (see Section 10 Collection And Preservation Of Postmortem Dental Evidence below).

The clinical examination may be recorded on a paper chart or digitally using an electronic dental record. Teeth are typically numbered using the locally recognized numbering system. In the United States, this is the Universal Numbering System (see Section 10.3.1 Numbering Systems, Narrative Descriptors and Nomenclature below). For most other countries, it is typically ISO 3950 2009-05-15 Dentistry — Designation system for teeth and areas of the oral cavity.

Basic data should be recorded in the comparative dental record and include the name or case number, the date and time of the examination, the jurisdiction or authority for the examination, the location of the examination and all relevant demographic data. Additionally, if the data being recorded is of a decedent the remains description including the approximate age, sex, biologic affinity and postmortem condition should be documented.

The record should reflect any missing dental structures or jaw fragments as well as those present and available for evaluation. An odontogram (graphic chart of the condition of the teeth) should illustrate as graphically as possible the following:

- Clear annotation of tooth numbering and surfaces;
- Configuration of all dental restorations (including prostheses), caries, fractures, anomalies, abrasions, implants, erosions or other features for all teeth;
- Materials used in dental restorations and prosthetic devices, when known;
- Periodontal conditions, calculus, stain;
- Occlusal relationships, malposed teeth, anomalous, congenitally missing and supernumerary teeth.

Any additional oral features, e.g., amalgam tattoo, lip, tongue stud, or similar decorative foreign body, bifid uvula, etc.

Clinical extraoral findings of the head and neck may also be of use in supporting or excluding the identification. Although, this is not a scientific identification by comparative dental analysis, this contextual data may be useful to the ME/Coroner.

7.1.1 Foreign Dental Records

Care should be taken whenever foreign dental records are received especially concerning tooth numbering (see Section 10.3.1 Numbering Systems, Narrative Descriptors and Nomenclature below). Whenever possible the dental provider who is both fluent in the language of the dental chart and has familiarity with the dental protocols from the country of origin of the chart should be utilized to verify that the data has been correctly transferred.

7.1.2 The Electronic Dental Record (EDR)

The electronic dental record is defined by the American Dental Association as a complete longitudinal history of an individual's dental care across all settings and encounters as well as the data types and relationships that would enable it to be created, stored, and managed electronically. Its structure, content and implementation requirements are covered in ANSI/ADA Standard No. 1067-2013 Electronic Dental Record System Standard Functional Requirements. The EDR is a primary source of antemortem dental information.

7.1.2.1 Antemortem EDR

Whenever possible electronic dental records should be used. Obtaining an antemortem EDR reduces the possibility of misinterpreting a chart due to illegibility. As with a paper chart, the EDR should include the condition of the teeth and oral condition as well as all treatment rendered. Ideally, this information should be accurately transferred to the comparative dental record, charted on an odontogram, and annotated as necessary with the dental status of each tooth including dental restorations, prostheses present, condition of the periodontium, pathologies present, bone and soft tissue anomalies, other anomalies, etc. Because of the diversity in EHR's, care should be taken to interpret the Odontogram properly. Currently, the only standardized format for the transfer of dental forensic data is ANSI-NIST ITL Type 12 Data Set (see Section 15.1.3 ANSI/NIST/ITL Standard below) which has yet to be widely adopted. Because of this limitation, EDR data may have to be transmitted in a paper format or as a PDF document. In addition, Proposed ANSI/ADA Technical Report No. 1085 Implementation Guidelines for the Secure Transmission of Protected Health Information in Dentistry should be consulted to insure that proper security protocols are followed concerning the transfer of this data.

7.1.2.2 Postmortem EDR – The Comparative Dental Record

As with all EDRs the recording of postmortem information electronically greatly reduces the possibility of errors. Some dental forensic packages have built in data verification algorithms that will further reduce the possibility of data entry errors. The teeth and oral condition should be accurately charted on an odontogram and annotated as necessary with the dental status of each tooth including dental restorations, prostheses present, condition of the periodontium, pathologies present, bone and soft tissue anomalies, other anomalies, etc. As with the antemortem EDR, care should be taken to properly understand all the symbols used in the Odontogram. Currently, the only standardized format for the transfer of dental forensic data is ANSI-NIST ITL Type 12 Data Set (see Section 15.1.3.1 Record Type-12: Forensic Dental And Oral Record below) which has yet to be widely adopted. Because of this limitation, EDR data may have to be transmitted in a paper format or as a PDF document. In addition, Proposed ANSI/ADA Technical Report No. 1085 Implementation Guidelines for the Secure Transmission of Protected Health Information in Dentistry should be consulted to insure that proper security protocols are followed concerning the transfer of this data.

7.2 Dental Radiographs

Every postmortem dental examination must include dental radiographs. An accurate dental examination without

dental radiographs is not possible, since there are many conditions that are only detectable with them; e.g. endodontically treated teeth, retained roots, impacted teeth, etc. Dental radiographs are the documentation that will be needed to substantiate conclusions. People can make recording errors in a chart, but radiographs are objective recordings of the dental characteristics/evidence. A thorough postmortem dental radiographic examination should include a complete series of periapical images of the available dental structures. Bitewing radiographs / projections / angulations should be included because they are the most common type found in antemortem dental records. In cases where a complete set of radiographs may not be obtainable, as complete an examination as possible should be performed. When taking postmortem radiographs the operator should be cognizant that the purpose of these images is for comparison to images taken when the decedent was alive. It is important that postmortem radiographs be properly angulated, exposed, processed and digitally enhanced as necessary. Other dental related postmortem radiographic images may include panoramic and occlusal imaging and CT imaging of the head.

7.3 Types of Dental Radiographs

7.3.1 Intraoral Radiographs

Conventional (film) or digital dental bitewing and periapical radiographs of the anterior and posterior teeth should be made in a consistent manner on all decedents and unidentified living individuals. A full mouth series of dental radiographs consisting of eighteen (18) radiographs should be made on adults with an intact dentition, which would include four (4) bitewing dental radiographs and fourteen (14) periapical dental radiographs. In lieu of conventional bitewings, a bitewing “projection” could be taken with the teeth out of occlusion using separate views of the upper and lower teeth with a horizontal bitewing angulation.

Although fewer radiographs may be taken when there are fewer teeth present or the dental evidence is fragmented, edentulous areas still need to be visualized. Edentulous areas or arches must be included in a radiographic exam as well as the empty alveolar sockets of teeth that have been lost postmortem. Occlusal exposures may be used for objects larger than a periapical film and may be helpful in radiographic documentation of the deciduous dentition.

Since the quality of the antemortem and postmortem radiographs will affect the ability to make a positive dental identification, it is imperative that, whenever possible, high quality images are obtained. The original antemortem radiographic images should be requested from the missing person's dental provider; however, the missing person's dental provider must still keep a duplicate set within the patient's record. For digital film, high-resolution single image radiographs should be sent along with a composite structured display (“mounted film”) image for location verification. Data transfer should follow ADA recommendations that include utilizing DICOM protocols (see Section 8.3.7 Electronic Transference of Data below). In cases where DICOM protocols cannot be utilized, the images should be properly annotated with the appropriate demographic data (name, date of birth, date of radiograph, etc.). A dental radiographic dot must be clearly visible on all images and special care should be exercised with some Phosphor Storage Plates (PSP) imaging systems where image reversal is possible (see Section 8.3.8 Data Discrepancies below).

7.3.2 Panoramic Radiographs

This type of image provides a large single radiograph that shows both jaws, the sinus cavities, nasal passages, lower portions of the orbits, and the angles of the mandible. The film is made with the head stabilized in a cradle while the x-ray source and the film cassette travel around the head. These images are not routinely taken in most dental offices; however, they are common enough that their use in forensics has to be considered. They should be used for comparison to antemortem dental images cautiously if the antemortem images are of a different type.

Sometimes, the individual teeth and supporting structures may overlap or be distorted, making comparison to other film difficult. In addition, the logistics of positioning a decedent's head, jaw or jaw fragments, onto the machine may prevent the production of a quality image.

7.3.3 Cone Beam Tomography

Cone beam computed tomography (CBCT) is a medical imaging technique consisting of X-ray computed tomography where the X-rays are divergent forming a cone, not thin or fan-shaped such as that used in typical medical computerized tomography (CT) units.

During dental imaging, the CBCT scanner rotates around the patient's head, obtaining 300 or more distinct images through 360 degrees of rotation. As a 3D rendition, CBCT offers an undistorted view of the dentition that can accurately visualize both erupted and non-erupted teeth, tooth root orientation and anomalous structures that conventional 2D radiography cannot.

CBCT has become increasingly important in treatment planning and diagnosis in implant dentistry, orthodontics, endodontics, oral surgery and interventional radiology (IR). The resolution of the images can range from 0.4 mm to as small as 0.125 mm in some units and the implications for forensic dental identification are enormous.

In addition to creating 3D images of the bone and facial soft tissue, any intraoral or extraoral film image view can then be reconstructed from one scan with the ability of the operator to select the desired slice location and orientation. Thus, a panoramic image can be recreated with an adjustable thickness or zone of sharpness and there are no superimposed anatomical structures. In addition, algorithms correct for the geometric distortions that are present in all two-dimensional images. There is no magnification and the images are 1:1 representations.

Two drawbacks of CBCT technology over that of medical-grade CT scans are the increased susceptibility to movement artifacts (especially in first generation machines) and the lack of appropriate bone density determination as measured in Hounsfield Units. The latter issue is of little significance with regard to dental identification.

The continued and increasing utilization of CBCT imaging technology in the field of dentistry is creating a new set of valuable forensic data. CBCT imaging technology allows for the reconstruction of standard dental radiographs from postmortem remains and allows for the possibility of three-dimensional superimposition of antemortem and postmortem virtual data for matching and identification. CBCT records also allow for virtual archiving of specimens, tele-forensic techniques, and Automated Dental Identification Systems. The possibilities of a CBCT scan use on decedents in a mass disaster should be considered if funding considerations can be addressed. A single scan of the victim could later be compared to any possible variety of submitted antemortem dental images (i.e. bitewings, periapical, panoramic, occlusal, PA skull, Waters view, etc.).

7.3.4 Medical Radiographs

These radiographs are made for orthodontic purposes or for diagnosis of head injuries, sinus problems, etc. They usually show the entire skull from a particular view or exposure. While anatomic features such as the sinuses, especially the frontal sinus in an anterior/posterior view or a Waters' view, can be depicted, the visualization of the teeth may be difficult due to overlapping of teeth, superimposition of the right and left sides of the arches and other types of distortion. All of these factors can make comparison of specific dental features difficult. However, medical computed tomography (CT) imaging of the head could be helpful when the scan includes the teeth and the jaws. These types of advanced images can allow visualization of the teeth and oral structures in the axial, coronal, and sagittal planes, 3-D reconstruction, and can mimic dental bitewing, periapical, and panoramic radiographs.

7.3.5 Photographs

Dental photographs may also be helpful in comparative dental identification and in documenting dental evidence, especially when there are unique dental features that would be difficult to describe. Photography can provide a double check for possible recording errors. Photographs, particularly those of the anterior teeth, may be useful for comparisons to antemortem photographs that show unusual features of these teeth. Images made could include anterior, right and left lateral, occlusal, teeth in occlusion, mandibular arch and maxillary arch views along with images of removable dental prostheses.

7.3.6 Three Dimensional Models

Three-dimensional models (study casts, working casts, 3D digital models), are often a useful source of antemortem information. Direct comparison of antemortem and postmortem dental anatomy as well as occlusal relationships may also serve as an extremely useful tool for comparative dental identification.

Three-dimensional models may also be used to preserve evidence in identification cases. It should be understood that due to the postmortem fragility of the teeth and the decomposition of the soft tissue, making impressions could alter the existing evidence. However, in certain cases, this procedure could be useful and the examining forensic odontologist should consider if making an impression is appropriate.

Preservation of dental cast evidence should be treated as any physical evidence. In addition, casts can now be digitized and stored in electronic form. The casts can also be recreated utilizing a 3-D printer.

7.3.7 Electronic Transference of Data

Ideally, EDR software would comply with American National Standard/American Dental Association Standard No. 1067-Standard Functional Requirements for an Electronic Dental Record System Section 4.2.1, Identify Participating Individuals Requirement 2.32. Therefore, the data should be sent electronically. The sections state that the “electronic dental system SHALL have the ability to reference the forensic dental data set, e.g., ANSI-NIST ITL Type 12 Dental Data Set (ANSI/ADA Specification 1058)”. Its future use should be encouraged in order to allow for the unambiguous transfer of dental forensic data.

Ideally the transfer of electronic images should be done in a DICOM format and include structured display (“mounted film”) information. If this is not possible, RAW, TIFF or high resolution and low-loss jpg may be used. Proprietary formats should be discouraged unless it can be verified that the recipient is able to process the format. Annotation of the image is highly recommended to prevent the possibility of errors in identifying the image. If this data is sent electronically, proper security and encryption protocols should be followed as per the American Dental Association Proposed Technical Report No. 1085 Implementation Guidelines for the Secure Transmission of Protected Health Information in Dentistry.

7.3.8 Data Discrepancies

Additional protocols should be in place to verify any discrepancies within the dental chart and between the dental radiographs and the dental chart in order to verify the causes. The possibility of charting errors, an incomplete chart, and treatment rendered in multiple locations, as well as possible fraud should always be considered. Additional errors include mislabeling or mis-mounting of radiographs. Film reversal, a known issue with some Phosphor Storage Plates (PSP) imaging systems, should also be investigated as a possible source of errors.

Ideally, a review board should be set up to make a final interpretation of ambiguous data and memorialize these coding rules so that a consistent coding protocol is in place with documentation for future reference.