A168 A Novel Method to Augment Personal Identification in the Medical Examiner/Coroner Setting

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Learning Overview: After attending this presentation, attendees will have been introduced to a new method under development for use in medical examiner and coroner offices to augment personal identification through statistical evaluation of circumstantial evidence. Attendees will be able to assess the potential of this method to improve identification outcomes for individual decedent cases and mass fatality cases when results from DNA and other methods are inconclusive or absent.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by introducing the details of a novel, mathematically based method that can assess the weight of pertinent medicolegal case evidence to quantify the strength of a personal identification.

Medical examiners and coroners in the United States are responsible for the identification of unknown decedents under their jurisdictions. Most unidentified bodies receive a timely identification through fingerprints, dental records, or medical records. Other identifications, such as DNA comparison with a family reference sample, take longer but are still usually successful. However, many decedents remain unidentified for decades when the above-listed methods cannot be used or are inconclusive. The reasons for unsuccessful identifications are not typically due to a lack of investigational effort. The fundamental issue resulting in failure to identify bodies is simply that the arsenal of identification methods is still inadequate. In 2016, the Disaster Victim Identification Subcommittee of the National Institute of Standards and Technology-sponsored Organization of Scientific Area Committees released a Research Need Request for "development of population-level likelihood values for circumstantial evidence to be used in support of human identification."[1]

A method that quantifies the strength of the evidence collected by investigators (e.g., clothing, geospatial relationships of body location and residence, personal effects), as well as skeletal findings (e.g., demographic profile, anomalies, bony reactions to antemortem trauma or pathological conditions) will be a valuable tool in personal identification. This idea has been posited in the forensic literature but has not yet been operationalized.[2] It is time to develop an instrument that applies statistical weight to the available qualitative evidence, test it, validate it, and apply it to personal identification in death investigations.

A Bayesian model was built to describe a population created from pseudo-data representing a random set of 5,000 medicolegal decedents with certain properties. The goal of the model was to estimate a 95% credible interval from the posterior distribution of the model for the proportion of a population that has a given profile of features. The model was fit using the Bayesian modeling language Stan (https://mc-stan.org) and the statistical language R (https://cran.r-project.org). The final production version will have a user interface to these programs. The model incorporated six features: sex, age, height, simplified ancestry (European, African, Hispanic, and Asian), presence of a tattoo, and evidence of antemortem fracture. The distributions of height, ancestry, tattoo, and fracture were assumed to be dependent on age and sex, but future testing of the model using real data may result in more relationships between features.

The model generally fit the data well, except for tattoos; a misspecification in the model resulted in a prediction of more tattoos in older people than the population would support. A test of the model on one living individual resulted in a prediction that the proportion of similar individuals in the population was small, between 0.29% and 0.36%. This investigational model forms the framework for an expanded instrument under development that will be tested using data from a sample of 5,000 actual medical examiner cases.

Reference(s):

1. www.nist.gov/sites/default/files/documents/2016/08/29/osac_disaster_victim_identification_research_needs_assessment_form_-_contextual_id.pdf.
2. Steadman D.W., Adams B.J., Konigsberg L.W. Statistical basis for positive identification in forensic anthropology. *Am J Physical Anth* 2006; 131(1):15-26.

Identification, Forensic Anthropology, Forensic Pathology

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