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COMPUTERIZED DENTAL CODING AND SORTING ALGORITHMS: IS THERE A BEST?

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For many mass fatality incidents, dental comparison serves as a primary means of victim identification. Software packages such as Plass Data's DVI System, WinID3 and UVIS/UDIM use software algorithms to provide Forensic Odontologist with an objective "best-match" tool from which to undertake a more in-depth review of the dental records. The role of computer ranking programs is to compare antemortem and postmortem records and quantify the number of matches, mismatches, and possible matches between records. The computer then ranks the various records based on a sorting algorithm (e.g., most matches followed by least mismatches). Within the field of forensic odontology there is no universally agreed upon coding system that is used for documenting tooth conditions. In addition, although many different sorting algorithms exist there has been no true controlled study to see if a single algorithm will work well in multiple situations (e.g., mass fatality incidents (MFI), national missing person's databases, and low and high fragmentation incidents). The goal of this research is to compare the effects of coding granularity (i.e., detailed

codes versus simple codes) as well as multiple ranking algorithms. This analysis was performed with a new simple coding system and concurrent optimized ranking algorithm being tested at New York City's Office of Chief Medical Examiner (OCME).

For this study, a large sample of adult dental data was compiled from numerous United States National Health and Nutrition Examination Studies (NHANES). The available data consist of approximately 35,000 records. These databases allowed the controlled changes in order to test different coding and ranking methodologies. To explore the effect of various levels of coding discrepancies, the database were modified to reflect various rates of coding discrepancies, fragmentation types and size of the incident or database. In addition, tests were performed on dental data from three actual MFIs (World Trade Center, AA Flight 587, and USAir Flight 427).

Currently MFI odontology management software is based on a high degree of granularity; following the concept that "more is better" with respect to coding. More detailed codes imply a greater level of precision in documenting the dental status and, potentially, greater accuracy in the resulting ranks. In addition, highly granular data offers the ability to perform "focused" searches. The potential pitfalls of detailed coding may include data entry errors, lack of compliance/understanding, and a slow/tedious charting process. The important consideration for computerized ranking is to utilize a coding format that provides the best results with the least amount of effort.

The data were analyzed using the algorithms for Most Dental Hits and Least Dental Mismatches as well as OCME's optimized ranking algorithm. The comparisons were done using WinID's detail coding as well as OCME's simplified coding format. Databases simulating different incident sizes and degrees of fragmentation, as well as the real world MFI data, were tested. In all cases, OCME's optimized ranking, using either the detail or simplified coding, outperformed commonly used algorithms. When using the optimized ranking algorithm, differences between detail and simple coding were only seen in very large, highly fragmented simulations.

***KEYWORDS*:** Forensic Odontology, Mass Disasters, Software, Plassdata, WinID.

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