

G35 An Evaluation of a Multimedia Training Module and Lab for Teaching Radiographic Technique and Safety When Using Hand-Held Portable Dental X-Ray Equipment in Forensic Odontology

Tara L. Newcomb, MS*, Old Dominion University, School of Dental Hygiene, 4608 Hampton Boulevard, Norfolk, VA 23529; and Ann M. Bruhn, MS, Old Dominion University, School of Dental Hygiene, 4608 Hampton Boulevard, Norfolk, VA 23529

After attending this presentation, attendees will: (1) become familiar with safety protocol when using hand-held portable dental X-ray equipment and radiographic techniques for minimizing errors requiring retake images in the categories of placement, angulation, exposure, and other errors; and, (2) be able to develop teaching strategies to train others for the safe and effective use of hand-held portable dental X-ray equipment in forensic odontology.

This presentation will impact the forensic science community by providing information that can be used for understanding and teaching safe and effective use of hand-held portable dental X-ray equipment in forensic odontology.

Hand-held portable X-ray devices are increasingly used in dental and forensic practice. This development introduces new challenges to radiographers for which original safety and technique evaluations must be made and implemented prior to use.¹ Forensic experts were first introduced to hand-held portable X-ray devices in Thailand following the 2004 Asian Tsunami; these devices proved to be essential to dental identification efforts, particularly in mass fatality events.² Currently, there is limited research on teaching safe and effective usage of hand-held portable X-ray devices in forensic odontology. Major issues for safe usage and effective radiographic technique have been outlined in the literature as: difficulties in using aiming devices in conjunction with hand-held portable X-ray equipment, radiographic and angulation techniques for minimizing errors requiring retake images, using infection control and Personal Protection Equipment (PPE), and safeguarding of the operator and persons involved in assisting. These problems could result in safety and manufacturer guideline infractions, as well as deviations from the As Low As Reasonably Achievable (ALARA) principles, when compared with other available intraoral X-ray devices, for example, wall-mount units.³ Teaching and training with multimedia and using computers to present subject matter with sound, graphics, and video have been used in developing forensic training in dental and dental hygiene curricula.⁴⁻⁵ Multimedia is specifically recommended in forensic training because it is “interactive” and provides an “active learning” experience.⁶⁻⁷ Multimedia is used across disciplines because it has been found to support the way the human brain learns.⁶⁻⁷

For this study, researchers will use a multimedia module with video demonstrations to teach radiographic technique and safety when using hand-held portable X-ray equipment. This module will be made available via a Blackboard University learning system. Forty junior dental hygiene students (participants) enrolled in an Oral Radiology I course will be recruited for the study; researchers will submit applications for Institutional Review Board (IRB) approval. Participants will be required to view the multimedia demonstration video prior to completion of a radiology lab where in-person demonstrations will occur. Participants will take identical sets of X-rays using both a portable hand-held X-ray unit and a wall-mounted X-ray unit. Real human skulls and a standard image receptor holding device will be used to test radiographic technique between the two types of equipment (portable hand-held X-ray device versus a wall-mounted X-ray unit). Participants ($N=40$) will expose six X-rays per type of equipment for a total of 480 X-rays to be scored in these four radiographic technique subcategories: placement, angulation, exposure, and miscellaneous or other errors. Analysis of Variance (ANOVA) will be used to compare the sum of the errors for each device (portable hand-held device versus a wall-mounted unit). *T*-test analysis will be used to determine significant differences between the subcategories of each error category. Safety will be measured by a 12-question post-test related to infection control and PPE, ALARA guidelines, and safeguarding of the operator and persons involved in assisting when using portable hand-held X-ray devices. Scores will be presented as grade percentages.

It is hypothesized that a significant difference will be found at the .05 level between the two types of equipment used for radiation exposure (portable hand-held X-ray unit versus a wall-mounted unit), with the portable hand-held X-ray device unit having the least amount of total errors and higher scores on the safety post-test.

This research could impact the forensic science community by providing data on comparing safety and technique exposure from traditional wall-mounted X-ray units to the use of hand-held X-ray devices and as a way to address common radiographic technique errors specific to forensic odontology.

Reference(s):

1. Berkhout W., Suomalainen A., Brullmann D., Jacobs R., Horner K., Stamatakis H. Justification and good practice in using handheld portable dental x-ray equipment: A position paper prepared by the European Academy of Dentomaxillofacial Radiology (EADMFR). *Dentomaxillofac Radiol.* 2015; 44: 20140343.
2. Petju M., Suteerayongprasert A., Thongpud R., Hassiri K. Importance of dental records for victim identification following the Indian Ocean tsunami disaster in Thailand. *Public Health.* 2007; 121: 251-257.
3. Pittayapat P., Thevissen P., Fieuws S., Jacobs R., Williams G. Forensic oral imaging quality of hand-held dental X-ray devices: Comparison of two image receptors and two devices. *Forensic Science International.* 2010;194:20-27.
4. Stoeckel D., Merkle P., McGivney J. Forensic Dental Training in the Dental School Curriculum. *J Forensic Sci.* 2007; 52(3): 684-686.
5. Hermsen K., Johnson D. A Model for Forensic Dental Education in the Predoctoral Dental School Curriculum. *Journal of Dental Education.* 2012; 76(5):553-561.
6. Mayer R., Fennell S., Farmer L., Campbell J. A personalization effect in multimedia learning: Students learn better when words are in conversational style rather than formal style. *Journal of Educational Psychology.* 2004; 96(2):389-395.
7. Mayer R., Moreno R. A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. *Journal of Educational Psychology.* 1998; 90: 312-320.

Education, Radiation Safety, Radiation Technique