2019 CAR ASM Scientific Research Project – 1st Place Winner

Abstract #84

Does Cadaveric Simulation Training Improve Resident Knowledge and Confidence in Performing Fluoroscopic Guided Joint Injections?

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OBJECTIVE: To assess whether cadaveric simulation training session was effective in improving radiology residents' knowledge and confidence in performing fluoroscopic guided joint injections.

METHODS: Between July 1, 2015 and August 31, 2017, consecutive first year radiology residents participated in a dedicated musculoskeletal cadaveric injection training module. The session included a didactic component with slide presentation and discussion addressing the basic principles of arthrography, consent, safety issues, relevant anatomy, patient positioning, and techniques of injection. This was followed by a practical hands-on component, supervised by two fellowship trained musculoskeletal radiologists, with trainees performing fluoroscopic guided hip and shoulder injections on fresh whole-body cadavers. All residents completed pre- and post-session questionnaire comprised of multiple Likert-scale questions, asking about their knowledge on the indications, contraindications, preprocedural care and complications, as well as their technical ability. Each item was scored with 5 points scale (Poor=1, Fair=2, Good=3, Very good=4, Excellent=5). Additionally, the post-session questionnaire asked the trainees' rating of the experience of the session, using the same scale.

RESULTS/DISCUSSION: 16 residents participated in the session during the period. The self-rating scores were significantly higher in the post session questionnaire in all individual items including knowledge of indications, contraindications, preprocedural care, complications, and technical ability (p-value= 0.0004, 0.0005, 0.0003, 0.0005 and 0.0005, respectively, Wilcoxon signed-rank test). 94% of the participants rated the session contents, hands on experience, teaching quality and session organization as excellent.

CONCLUSION: Cadaveric joint injection simulation training significantly improved trainees' subjective knowledge, confidence and technical ability in performing joint injections.

2019 CAR ASM Scientific Research Project – 2nd Place Winner

Abstract #143

Deep Learning for Automatic Multi-Catheter Detection on Pediatric Radiographs

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OBJECTIVE: To develop and evaluate a scale recurrent neural network (SRNN) to automatically detect catheters on pediatric radiographs.

METHODS: 2D projections of nasogastric tubes, endotracheal tubes, and umbilical arterial and venous catheters were simulated and superimposed on 2515 adult chest radiographs. This dataset was used to train a SRNN for catheter detection. Lines and tubes on 35 pediatric chest/abdomen radiographs were manually annotated to create groundtruth annotation maps which comprised the test dataset. The performance of the network to detect catheters on pediatric radiographs was subsequently evaluated by comparing catheters detected by the network with the groundtruth annotation maps using precision, recall, and an F-measure combination of precision and recall (Fb, with b = 0.3). Performance of the network was compared to two previously developed networks.

RESULTS: The trained SRNN was able to successfully detect and localise multiple catheters on pediatric radiographs in the test dataset. The network at the highest scale achieved an Fb of 0.8009 with precision 0.8411 and recall 0.6909. The SRNN (Fb = 0.80) outperformed both a vanilla feed-forward neural network (Fb = 0.77), and a previously published fully convolutional network designed to detect only single PICC lines (Fb = 0.58).

CONCLUSION: The SSRN trained using simulated/synthetic data superimposed on adult chest radiographs achieved promising results for catheter detection on pediatric chest/abdomen radiographs. Use of synthetic data may reduce data requirements for training neural networks for catheter detection. This approach may inform the development of a solution to automatically flag and prioritize radiographs with malpositioned catheters.