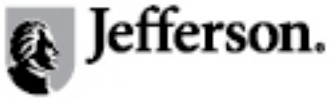

Phase 1

Class of 2022

1-2020

Assessment of Dobhoff Tube Malposition on Radiographs Using Deep Learning

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SKMC Class of 2022: SI/DH Abstract

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Assessment of Dobhoff Tube Malposition on Radiographs Using Deep Learning

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Introduction: Dobhoff tubes (DHT) are narrow-bore flexible devices that deliver enteral nutrition for critically ill patients. Tracheobronchial insertion of DHTs presents a significant risk for pulmonary complications. Thus, DHT insertion requires radiologist confirmation of correct placement with chest x-ray (CXR), increasing clinical delays. To address this, we demonstrate the novel application of Deep Convolutional Neural Networks (DCNNs) to automatically and accurately identify DHTs in CXRs in real time.

Methods: 141 de-identified HIPAA compliant frontal view chest radiographs containing DHTs in various positions were obtained. The DHTs were first manually segmented and verified by a board certified radiologist. Images were split into training (126) and test (15) sets. Data augmentation consisted of horizontal flipping, rotation, sheer, and translation steps. A pretrained deep convolutional neural network model with the U-Net architecture was employed. This net was trained using TensorFlow 2.0 and a 1080ti NVIDIA GPU. The training ran for 300 epochs with an Adam optimizer (learning rate = 0.0001), using an intersection over union (IOU) loss function.

Results: The fully trained network achieved a Sørensen–Dice coefficient of 0.7 between the predicted and ground truth segmentations. This suggests that the DCNN

was able to identify DHT both accurately and in a variety of use cases. Run time per image was less than a second, demonstrating the efficiency of this computer-based method.

Discussion: A Dice coefficient of 0.7 represents strong accuracy and supports the hypothesis that DCNN may be employed to automatically identify DHT positioning. This suggests that deep learning can segment and highlight DHTs, potentially aiding clinical teams. Performance could improve with more training cases and standardization of preprocessing. Future directions include research on the real world impact of such solutions on clinical teams, including whether such a system improves safe DHT placement outcomes on floors.

No references/tables/figures/appendices allowed.