Evaluation of Abnormal Axillary Lymph Nodes During Breast Cancer Screening

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Background: Evaluating the axilla for abnormal lymph nodes is important for the early detection of primary disease. Unilateral axillary lymphadenopathy may have multiple etiologies, including malignancy, infection, autoimmune disorder, iatrogenic, and reactive causes. When evaluating patients for breast cancer, differentiating between normal and abnormal axillary lymph nodes by ultrasound (US) imaging is standard. In order to determine if a suspicious lymph node is present, it is necessary to have specific criteria for differentiating between normal and abnormal lymph nodes. Abnormal axillary lymph node findings were reported in breast cancer patients and providers must be aware of variations in abnormal findings.

Methods: We reviewed the world literature that describes the morphology and other distinguishing characteristics of normal and abnormal axillary lymph nodes, as seen by ultrasound.

Results: The US is inexpensive, has no radiation, and is very effective at evaluating characteristics and morphology of axillary lymph nodes. The ultrasound characteristics of a normal axillary lymph node are: an oval shape with a smooth, well-defined hypoechoic cortex, and an overall size of less than 10 mm. The hypoechoic cortex should be less than 7 mm, and have an echogenic hilum with normal vascularity. Abnormal lymph nodes should be evaluated for size, matting, mobility, consistency, vascularity and location. Lymph nodes measuring over 10 mm are usually considered abnormal, however, it depends on the region of the body. Jugulodigastric and inguinal lymph nodes, for instance, measuring over 15 mm are abnormal, and palpable nodes in the supraclavicular or popliteal region are considered pathologic no matter the size. Pathological lymph nodes may have focal or diffuse cortical thickening, nonhilar cortical blood flow, loss of echogenic hilum, and contour abnormalities.

In a study performed by Amitai et al in 2016, abnormal lymph node shape was associated with malignancy in 26% of patients. Lack of a preserved hilum was associated with malignancy in 29% of patients. Additionally, malignancy was associated with increased size and cortical thickening.

Conclusion: Abnormal axillary lymph nodes have a specific appearance on US, and their detection can help identify patients with breast cancer who need fine needle aspiration of their lymph nodes.

Training Artificial Intelligence Neural Networks to Detect Devices on a Chest X-ray, a Pathway to COVID-19 Testing

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Background: Utilization of Artificial Intelligence (AI) in medicine is growing in relevance, especially given the current prevalence of COVID-19. The current world literature shows that identifying chest x-ray pathologies is a current use case for AI in healthcare and recently an algorithm was developed to screen chest x-rays for areas of fluid and inflammation, suggesting COVID-19 cases. Using a trained neural network to screen chest x-rays can ease the workload and impact healthcare access. Publicly accessible databases of radiographs, and inexpensive neural networks make developing AI use cases attainable. We have developed a method of training AI neural networks to identify chest devices placed in patients.

Methods: We utilized the open source image classification neural network, Inception v3, from TensorFlow (Google Brain Team, Mountain View, CA) and trained it with images from Chest X-Ray 14 (a NIH Clinical Center public access data set). Our original work trained the neural network to detect medical devices on chest x-rays with cases that included devices either in isolation or presented with other devices. This project aims to improve the accuracy of the neural network by training the neural networks by training on images where medical devices and hardware are presented in isolation. At the conclusion of training, accuracy was evaluated; results were recorded.

Results: After training on the sorted chest x-ray images, accuracy of the original neural network was low. Preliminary results using the revised methods indicate 86.7% accuracy for pacemakers, a significant improvement from the previous network.

Conclusions: Results show higher accuracy of the neural network with the modified methods. One source A significant improvement came from training the network on chest x-rays that only contained a single device rather than multiple. This provides a base for use cases such as a network trained to identify medical devices and monitor integrity of drains, probes or tubes ensuring they remain effective and undisturbed. We hope that our work will

facilitate and motivate involvement of more medical students and trainees in helping develop the use of AI in screening chest x-rays for COVID-19 pneumonia.

Coronary Computed Tomography Angiography and Coronary Artery Calcium Scoring in an Outpatient Setting: Barriers to implementation

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Background: Coronary Computed Tomography Angiography (CCTA)and Coronary Artery Calcium (CAC) scoring have become well-established, cost-effective screening tools for coronary artery disease (CAD) in an Emergency Room setting, but not yet in outpatient settings. Barriers exist that prevent widespread use of CCTA, including: primary care doctors still prescribing stress tests over CCTA and Medicare failing to cover CCTA costs.

Methods: A review of the world literature was performed to assess reasons for the slow acceptance of, and payment for CCTA and CAC scoring in appropriate clinical settings. The relative value of stress testing vs CCTA was also compared.

Results: Multiple barriers to availability of CCTA and CAC scoring that were discovered.

Education Costs: Primary care physician education and familiarity with new ACC/AHA* guidelines and consensus statements on utilization of CCTA. Practice guidelines are continuously evolving, and the use of CCTA and CAC scoring in multiple clinical scenarios is expanding.

Reimbursement Costs: Medicare and other payers are slow to accept and pay for new clinical applications, even when supported by research data. In 2017 the UK's National Institute for Health and Care Excellence changed its guidelines to make CCTA the first-line test for CAD due to its low cost and high sensitivity.

Implementation Costs: Many radiology departments cannot provide 24/7 CCTA services as it requires expensive CT scanners and training of technologists and radiologists.

Conclusions: To increase access to CCTA it's important to: expand education to providers/ physicians, work with payers to improve reimbursement, and allow radiology departments to increase staffing and education.

A Worldwide Comparative Review of the Incorporation of Interventional Radiology into Medical School Curriculum

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Background: Interventional radiology (IR) is a specialized field within radiology that combines high-tech diagnostic imaging and minimally invasive procedures to tackle complex medical conditions. Despite the growing use of IR, its integration into the medical school curriculum is limited. There is a need for greater exposure to IR in medical schools to increase knowledge, interest, and application into this field. Medical schools globally are exploring different methods to incorporate IR education into medical school curricula. This study aims to assess the current knowledge, exposure, and strategies different schools worldwide use to implement IR education into their medical school curriculum.

Method: We performed a review of world literature that surveyed medical students from 99 medical schools in Europe, 2 in Australia, 3 in Asia, 13 in North America and 3 in Africa. With this information, we evaluated current education, exposure, and interest in incorporating IR into international medical education.

Results: We tabulated the results from published studies and will present that data. In 2018, a survey in Spain was conducted on medical students that showed that 313 out of 414 (74%), students had poor knowledge of IR but were positive in their desire to have the program incorporated into their medical education. In 2019, another study in the United States suggested that Simulation-Based Learning sessions, didactic introductory lectures, and case-based discussions showed strong effects in increasing students' interest in IR. Furthermore, a study in Europe encouraged the use of the flipped classroom approach to enable students to play a more active role in their learning. Students received unrestricted home access to IR video lectures, small group clinical scenarios, and other modules which increased student interest and engagement in IR.

Conclusion: Across nations, there is little to no difference in medical students' exposure to IR and knowledge base. IR is a new specialty not well known by medical students due to a