A novel tool to improve detection of fractures on radiography: the digital anatomic avatar.

The Problem

An accurate history can improve a radiologist's interpretation. However, this information is often absent from requests since detailed text entry can be time consuming. The absence of localizing information can reduce the accuracy of a radiologist's interpretation or increase the need for follow-up or cross-sectional imaging, raising costs.

Since the introduction of computerized provider order entry, graphical user interfaces have become an option. If appropriately developed and implemented, anatomical avatars can improve communication between healthcare providers.

A well-designed graphical order entry system can help referrers by reducing order entry time, improve radiologist accuracy by improving the quality of the information available at the time of interpretation and improve patient safety by reducing errors.

Aim/Goal

The aim for the project was to determine the influence of the avatar on the sensitivity, specificity, degree of confidence (DoC) (scale 1-10) and time to interpret the radiograph.

The Team

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The Interventions

A randomized study set of 99 subtle foot fractures (99/226, 78%) and "non-fractured" foot radiographs (all confirmed with follow-up imaging) was provided to radiologists for interpretation, using an internally developed computer based order entry form based on the patient's medical record (Figure 1).

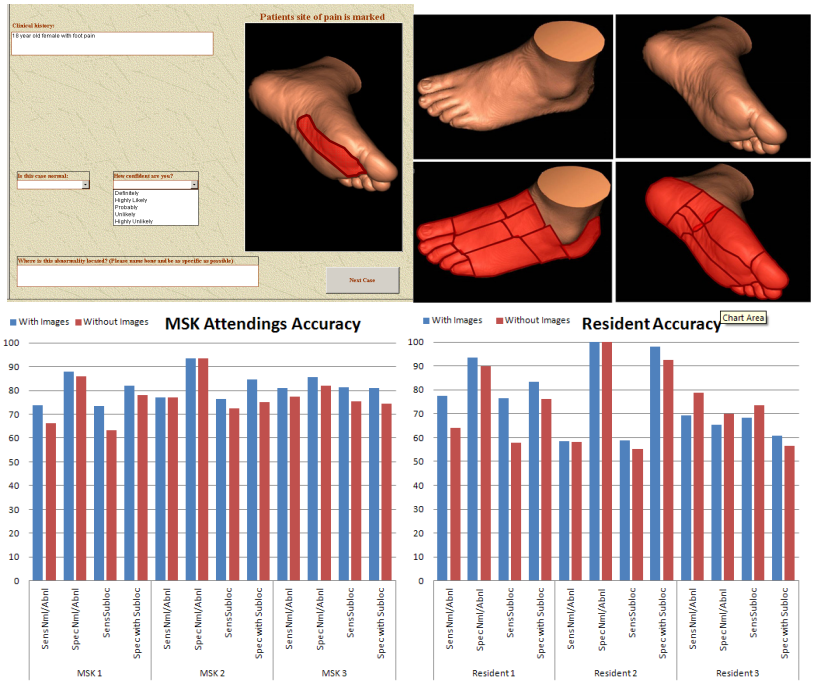
Approximately 50% (110/227) of the radiographs were provided with a text based history as in current clinical situations. The remaining radiographs were provided with an image-avatar based history.

The time for radiograph interpretation, radiologist's interpretation of the radiograph and the radiologist's degree of confidence in their interpretation was recorded.

The Results/Progress to Date

The location of the patient's pain was provided to radiologists by the referring physician in 36% (83/227) of radiographs in the original text based order. The location of pain for the remaining studies was recorded from the patient's medical record, when available.

A digital avatar increased sensitivity for a subtle fracture from 68.4% to 70%, specificity from 89.9% to 91%, mean DoC from 8.0 to 8.3 ($p<0.001$) and shortened interpretation time from 61 to 55 seconds ($p<0.001$), across radiologist experience and sub-specialization.



Lessons Learned

A digital avatar complements the text history provided to an interpreting radiologist, improves sensitivity, specificity, localizing ability and degree of confidence and decreases the interpretation time.

Next Steps

- A second phase "double-blind" study will be performed to confirm the results.
- Other modalities and indications will be assessed and avatars developed for these modalities
- Information Systems specialists involved with provider order entry will be consulted to determine feasibility of introduction into BIDMC systems

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