

Validation of HealthOST by Nanox.AI – image processing software that provides qualitative and quantitative analysis of the spine from CT images to support clinicians in the evaluation and assessment of musculoskeletal disease of the spine

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Introduction

Vertebral Compression Fracture (VCF) are common with an estimated incidence of 10.7 per 1000 women and 5.7 per 1000 men. These are visible on CT, but may not be the indication for the imaging and so may not be reported.

History of fracture is one of the most significant predictors for future fracture, and so there is a risk of further VCF, leading to chronic back pain and kyphosis, or non-spinal fracture such as neck of femur, associated with significant morbidity and mortality.

Osteoporosis, as a common cause of VCF, is a common and manageable condition, and early treatment and intervention may reduce fracture risk and so improve outcomes.

HealthOST is an image processing software that from Nanox.AI, providing qualitative and quantitative analysis of the spine from CT images to support clinicians in the evaluation and assessment of musculoskeletal disease of the spine. The HealthOST software provides the following functionality:

- Labelling of T1-L4 vertebrae
- Measurement of height loss in each vertebra (T1-L4)
- Measurement of the mean Hounsfield Units (HU) in volume of interest within vertebra (T11-L4)



A sagittal section of the spine on CT, showing a vertebral collapse fracture of a thoracic vertebrae. A height loss of 31% height correlates to a moderate VCF.

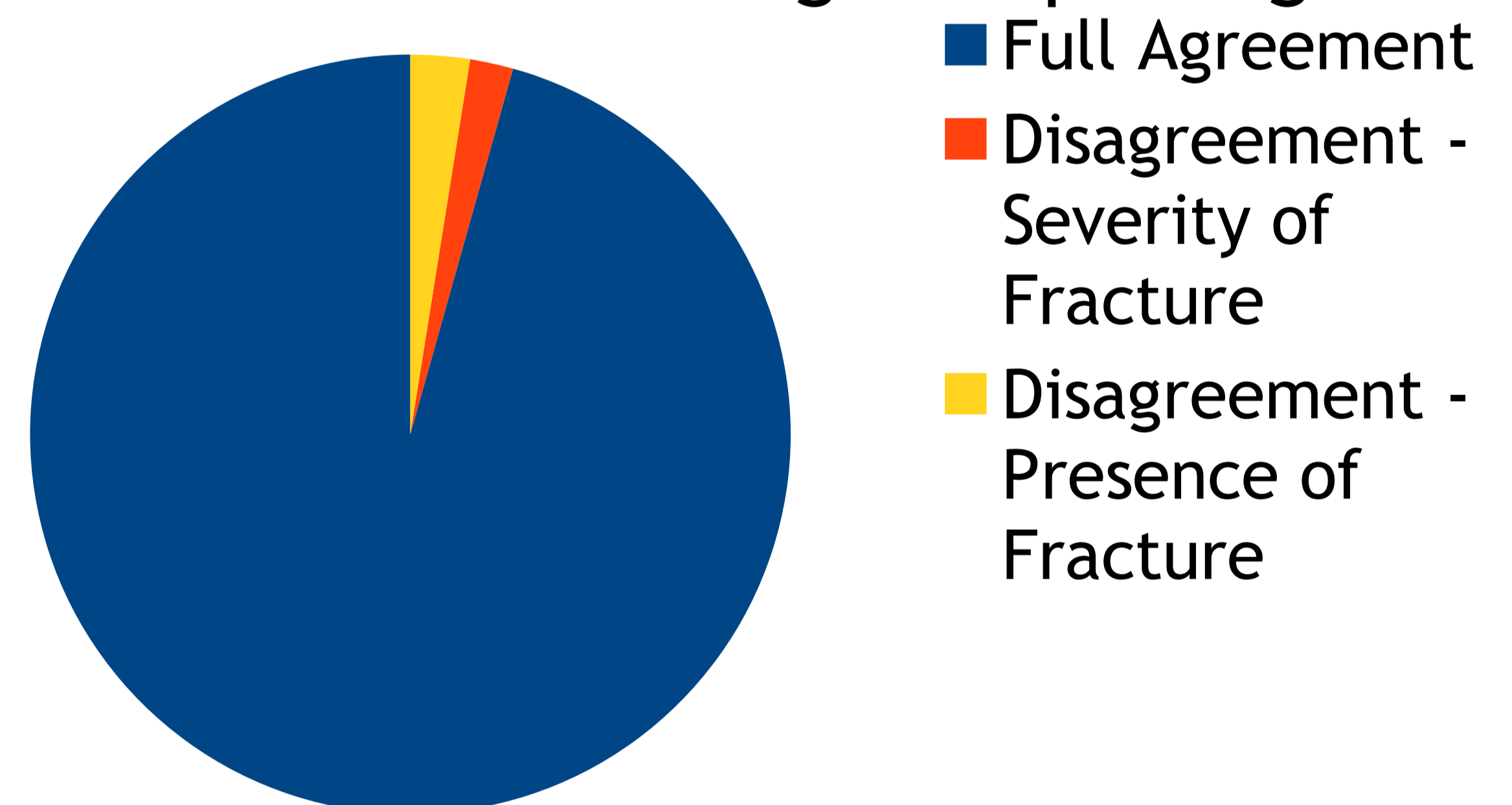
Validation

The CT images were analysed by HealthOST, reporting the existence and severity of VCF between T1-L4. These images were also independently reviewed by a consultant radiologist tasked to report VCF. This radiologist was blinded to the HealthOST outcome. HealthOST successfully analysed 597 images (of 619). In 571 cases (95.6%) there was full agreement with consultant report. In 11 cases (1.8%) there was agreement on presence of fracture, but disagreement on severity.

A 10% random sample was selected, along with cases where there was disagreement, for reporting by two trainees, who were blinded to prior reports. They agreed with HealthOST in 10 (40%) and 12 (48%) of discordant cases.

Overall HealthOST has a sensitivity/specificity of 0.814/0.996.

Health OST Compared with Consultant Radiologist Reporting



Discussion

Overall, HealthOST showed good ability to identify fracture, as well as to discriminate between levels of severity.

On cases with disagreement, further review agreed only slightly more often with initial consultant reviewer than HealthOST. The cases in which there were disagreement were not identical between the two second stage reviewers, implying that there is a level of operator dependant detection, and there was a similar level of disagreement with the initial reviewer as with HealthOST.

This supports the efficacy of HealthOST, and shows it could have a significant use case in detecting incidental VCF on CT imaging, potentially leading to investigation and early diagnosis of osteoporosis. Early diagnosis and intervention could then reduce future fracture risk, thus reducing morbidity and mortality.

The cohort selected for this study did not have an available DEXA scan as a rule, and so it was not possible to validate the ability of the software to determine bone mineral density, although this validation is currently underway by the team.

References