Goal-directed Ultrasound for the Diagnosis of Long-bone Fractures by Crew Medical Officer Analogs.
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Introduction
Current construction activities on-board the International space Station (ISS) may increase fracture
incidence in space, and ultrasound (US) is the only on-board diagnostic imaging capability. The clinical
utility of US in identifying long-bone fractures is unknown, particularly using non-radiologist operators.
We sought to determine the accuracy of US in identifying fractures of the humerus and femur, as
performed by emergency medicine physicians and surgeons with minimal experience in ultrasound image
acquisition and interpretation, after a standardized training session.

Methods:
The study was conducted between December, 2000, and August 2001, on patients enrolled after informed
consent from a convenience sample of all trauma patients admitted to the Emergency Department, in whom
x-rays of the upper arm, thigh, or hip was planned to rule out a fracture. The US images were obtained
before definitive radiologic studies, and were categorized as positive, negative, or indeterminate for
fracture. The investigators were physicians without formal training in US, who had previously viewed a 45
minute CD-ROM on bone ultrasonography followed by a one-hour training session on a live model.
Results were compared to initial clinical impression and final diagnosis determined by clinical evaluation
and subsequent radiologic evaluation.

Results:
In 35 patients, the humerus (11) and the femur (24) were imaged. Three US evaluations resulted in
indeterminate results. In the remaining 33, US was 100% sensitive in identifying a fracture (95% CI 0.89-
1.0) and 84% specific (95% CI 0.67-1.0), with an overall accuracy of 91% (95% CI 0.81-1.0). All patients
with high clinical suspicion for fracture, and one with moderate suspicion, were identified correctly by US
as having a fracture. None of the patients with an indeterminate US had a fracture.

Conclusions:
These preliminary data indicate that US is very sensitive and moderately specific for detecting acute
traumatic fractures in long-bones.