Ultrasound Imaging of Spine:
State of the Art and Utility for Space Flight

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Introduction
Ultrasound imaging (sonography) has been increasingly used for both primary diagnosis and
monitoring of musculoskeletal injury, including fractures. In certain injuries, sonography has
been shown to equal or surpass Magnetic Resonance Imaging in accuracy. Long-term exposure
to reduced gravity may be expected to cause physiological and anatomical changes of the
musculoskeletal system, which are not fully described or understood. In a limited-resource
environment like space flight, sonography will likely remain the only imaging modality;
therefore, further attention to its potential is warranted, including its ability to image anatomical
deviations as well as irregularities of vertebrae and the spinal column.

Methods
A thorough review of literature was conducted on the subject. A multipurpose ultrasound system
was used to identify specific vertebrae, intervertebral disks, and other structures of the cervical
spine in healthy volunteers, selected to represent various age, gender, and Body Mass Index
(BMI) groups. Sonographic views were sought that would parallel radiographic views and signs
used in the diagnosis of cervical spine injuries.

Results
While using widely accepted radiographic signs of cervical spine injury, this sonographic
protocol development effort resulted in successful identification of scanning planes and imaging
protocols that could serve as alternatives for radiography. Some of these views are also
applicable to diagnosing degenerative disk and bone disease, and other non-traumatic spine
pathology. Strong, preliminary correlation has been demonstrated in a number of clinical cases between sonography and other imaging modalities.

**Conclusion**

In the absence of radiography, sonography can be used to diagnose or rule out certain common types of cervical spine conditions including injury. Clinical validation of the findings appears to be realistic and would facilitate establishment of new sonographic protocols for special environments with lacking radiographic capability, such as human space flight.