

## Methodologies for Performing Non-Invasive Stimulated Muscle Force Assessment in Critically Ill Patients

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**Objective:** To optimize the assessment of muscle weakness in critically ill patients in the intensive care unit (ICU) by development non-invasive, reproducible assessment devices and application protocols. **Methods:** For over 5 years we evaluated weakness in ICU patients by employing a prototype non-invasive muscle force assessment system. We determined peak torques, peak rates of torque development and decay of the ankle dorsiflexors after supramaximal peroneal nerve stimulation. We continue to test modifications of our devices (i.e. different stabilizing boots, extendable leg support systems, electrodes) so to optimize this important clinical assessment. **Results:** Measurements were per-

formed in over 30 severely ill adult patients. During their illnesses, one observed dramatic reductions in stimulated torques, and during the recovery period, values increased to 70–80% of initial values. In those patients who died, the values continuously decreased until death. Throughout these investigations, several technical problems arose: i) the current device could not be used on patients in a prone position; ii) the mechanism used to adjust and lock ankle slipped; iii) edema made nerve stimulation difficult (altered skin conductance and difficult to maintain electrode position); iv) device was bulky for positioning (e.g., weight), and/or v) stimulus parameters could not be readily adjusted. **Discussion:** Stimulated muscle force assessment can be used to study ICU patients' forces. Nevertheless, next generation force assessment systems should be smaller, lighter, more portable, with a simple angle adjustment means, easier to use with a computer-controlled stimulator and include EMG recordings.