

VALIDUM Revised Appendix 1: Ultrasound Manual

To determine the median muscle layer thickness, the average of all the 2/3rd and midpoint measurements will be used for analysis.

Each patient will have a total of 4 ultrasounds (2 on each leg).

It is important that all sites undergo training on the procedures by following these instructions on volunteers before they start doing ultrasounds on patients.

Equipment Required:

1. Portable Ultrasound machine (General Electric Vivid or other portable ultrasound machine) using a high frequency linear transducer.
2. Tape measure

Procedure:

1. Review the instructions on paper and view training video.

Please refer to the following link for a training video.

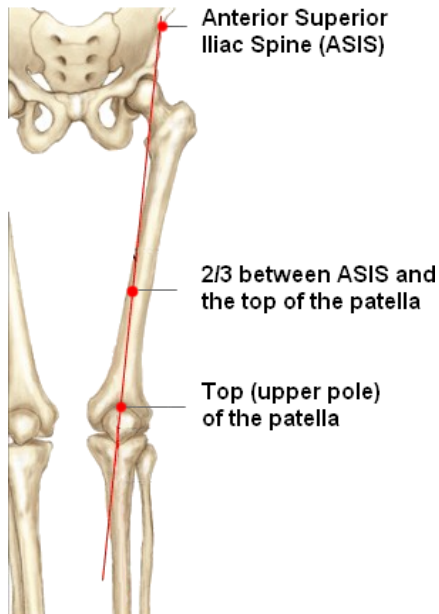
http://www.criticalcarenutrition.com/index.php?option=com_content&view=article&id=182&Itemid=79

2. Ensure that the patient is supine with knee extended and relaxed and locate the top of the patella and the anterior superior iliac spine (ASIS). Do NOT measure a leg if it has been injured or is asymmetrically swollen. Record "N/A" for injured or asymmetrically swollen legs.
3. Determine 2 points for measurement of quadriceps femoris muscle and mark the spot using a marker i.e.
 - Reading #1: At the border between the lower third and upper two-thirds between ASIS and upper pole of the patella.
 - Reading # 2: At the midpoint between the ASIS and the upper pole of the patella.

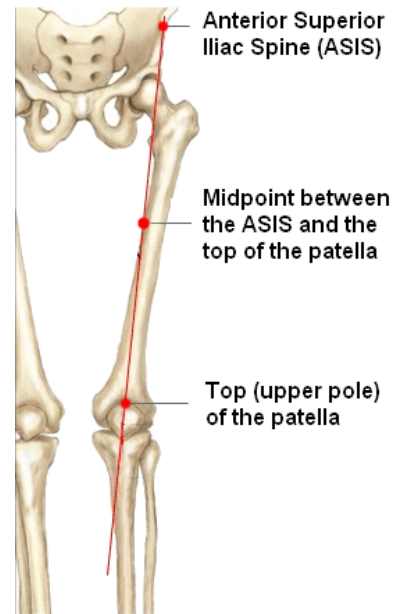
See table below

Note: In Obese patients, it may be very difficult to locate the ASIS. In such cases, note the distance from the upper border of the patella for all subsequent measures to be sure you are consistently coming back to the same place.

Reading 1: At the lower third between the ASIS and top of the patella



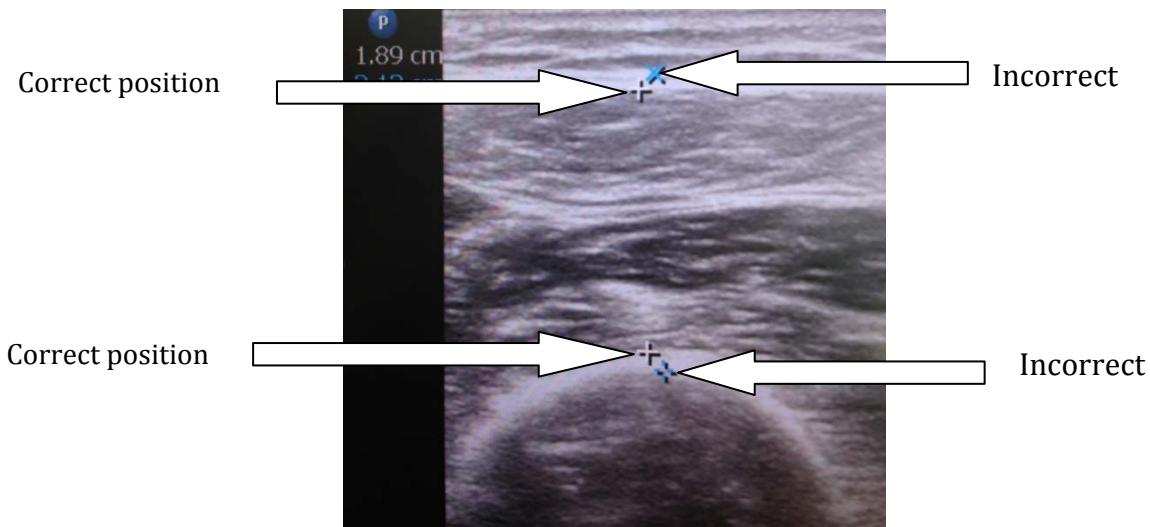
Reading # 2: At the midpoint between the ASIS and the patella



4. Provide a generous amount of ultrasound gel to the thigh area that is to be assessed.
5. Hold the ultrasound probe perpendicular to the skin. Use large ultrasound probe (i.e. 5 mHz).
6. Start at maximum depth to identify the femur. (“Depth button”) Set the electronic focus depth at the shallowest depth allowable to see the femur for the purposes of measurement.
7. Set frequency (2nd button on the left) at maximum allowable frequency (13 mhz on the GE machine).
8. Compress the probe maximally to measure muscle thickness directly anterior to the shaft of the femur. One of the greatest sources of variability in the measurement is how hard you push the probe down. Maximum compression refers to pushing as hard as the patient’s perceived sense of pressure/pain allows, however this is difficult to determine in ICU patients. When doing the training pre-study, you will need to calibrate what “maximal compression” is

compared to the trainer. When doing ultrasounds on patients, please be consistent and compress to this calibrated “maximal compression” to reduce huge variability in readings.

Muscle measurement should include the “black” area anterior to the femur and proximal to the adipose tissue (excluding the periosteum and the superficial muscle fascia). In other words, place the cursor at the black white interface below the fascia and at the black white interface above the periosteum_(see image below).



9. Take measurements at 2 points as indicated above in step 3
 - Measurement (roller ball or cursor); highlight caliper on screen
 - Mark depth @ surface of femur (press Set)
 - Make sure measurement line is perpendicular.
 - Mark proximal depth of muscle (press Set) up the fascia below the adipose tissue
 - Check top left of screen for measurements.

10. Repeat the measurements for the other thigh and record the results.