A new quick method to assess skeletal muscle mass: feasible for large cohorts?

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Objective We propose a novel proof-of-principle method to assess muscle volume and anatomical cross-sectional area (ACSA) from a single ultrasound scan. This quick, easy and cheap method rapidly improves **bed-side screening** of **malnutrition and sarcopenia** as part of **GLIM** criteria, and to assess whether treatment interventions and **patients outcomes are successful**.

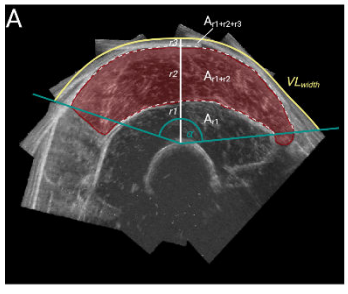
Resources & enablers A budget of €30,000 in salary is required for one postdoctoral researcher for the **duration of 12 months** at 0.3 FTE to conduct the translation of this proof-of-concept towards larger cohorts. All costs of the studies are covered (~2.7M euro) and additional support is provided by the project team, which consists of experts in muscle physiology, sarcopenia and (mal)nutrition research, from laboratory to clinical practice, **enabling direct translation from bench to bedside**.

Single image ultrasound muscle mass assessment

- ✓ Quick 5 min assessment of muscle mass
- ✓ Easy screening for large scale cohorts
- ✓ Validation in diverse populations
- ✓ Usable in research and practice
- ✓ Non-invasive
- ✓ Cheap

Planned activities & deliverables Data from ongoing studies of our team will be used, namely, ProIntens (hospitalized 55+; n=30), TEAMS (frail 65+; n=270) and ProMIO2 (ethnic minorities 65+; n=70). The validity and sensitivity to change reliability of the single image ultrasound against the gold-standard 2D ultrasound in assessing skeletal muscle mass will be done by performing Bland-Altman plots, regression analyses and intra-class correlation coefficients.

Single image ultrasound for the assessment of muscle size

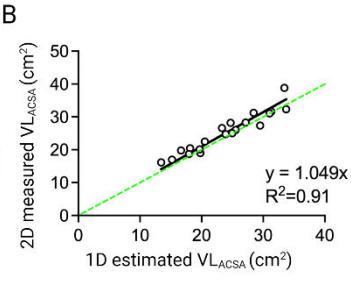


$$A = \pi r^2$$

$$A_S = \pi r^2 \times \frac{\alpha}{360}$$

$$VL_{width} = 2\pi r \times \frac{\alpha}{360}$$

$$\alpha = \frac{180}{\pi} \times \frac{VL_{width}}{r_{(1-3)}}$$



$$VL_{ACSA} = \text{FF} \times 0.5 \times \frac{VL_{width}}{r_{1-3}} \times (r_{1+2}^2 - r_1^2)$$

A. *A 2D anatomical cross-section of the Vastus Lateralis (VL_{ACSA}; in red), with its shape closely following a circular segment. VL width (in yellow) is measured on the skin, and the mid-muscle depths (r1, r2, r3) can be derived from a single ultrasound scan. Rearranging various algorithmic formulas related to the area of a portion of a circle allows for the determination of VL_{ACSA} using 4 quickly derived values.* ***B.*** *The estimated VL_{ACSA} correlates well with actual VL_{ACSA} when a form factor (FF) of 1.049 was included.*

Results & expected impact A pilot study in 21 healthy volunteers showed promising results with only a small deviation from stitched 2D ultrasound assessed muscle sizes. The next step is to **translate** these findings to measurements in **older adults, and larger study populations**. This very rapid assessment of muscle mass in clinical or community setting will bypass current methods, such as DEXA, MRI and CT, which are expensive, invasive, labour-intensive or sensitive to hydration imbalance. This novel method allows for **early detection and treatment** of **malnutrition and sarcopenia** in larger scale cohorts. As validation of the single image ultrasound will be done in a large **diverse population** of older adults, the method will be readily useable in various settings of research and clinical practice.

☒ **Please tick to confirm the PEN letter of endorsement is attached. Incomplete submissions will not be considered.**

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