# Calf muscle pump (“second heart in the calf”)

Education companion for the public piece. Not a practice guideline. Not a protocol. Schamma Salomon, MD, FACP.

## Physiology (established)

- Upright venous return depends on veins, one-way valves, and muscle pumps. StatPearls lists calf-pump failure among CVI etiologies with reflux and obstruction. *NBK430975*
- AVF: calf muscles acting as a pump propel venous blood toward the heart; inadequate valves or impaired pumping → stasis.
- Mayo Clinic (varicose veins, 2024 page): “Muscles tighten in the lower legs to act as pumps.”
- Mayo Clinic (DVT): when legs do not move, calf muscles do not contract; contractions help blood flow; prolonged sitting (travel, bed rest) increases DVT risk.
- Duplex ultrasound is the usual first CVI test; air plethysmography can assess reflux, obstruction, and muscle-pump function when duplex is incomplete (StatPearls).

### Observational — cite as association only

- **Ghorbanzadeh et al., Vasc Med**, DOI 10.1177/1358863X241311254. Mayo APG database, 7760 limbs / 3733 patients (2015–2023). Reduced CPF (EF) trended with higher CEAP ($p<0.001$). Reduced CPF independently associated with C5/C6 (OR 1.84, CI 1.5–2.2) after age, sex, incompetence, obstruction. Mildly reduced EF 40–49% not associated with ulcers. Not a treatment trial; does not prove walking heals ulcers.
- **McBane et al., Mayo Clin Proc. 2024;99(6):902-912**, PMID 38661596. n=5913 consecutive APG patients; median f/u 2.84 y; 431 deaths. Mortality HRs vs EF ≥50%: 40–49% 1.4 (1.0–2.0); 30–39% 1.6; 20–29% 1.7; 10–19% 2.4 (1.7–3.3). Valve incompetence not independently predictive; CEAP was. Authors suggest muscular physiology may matter. Residual confounding likely. **Do not claim ambulation prevents death from this paper.**

## Public counseling used in this package

- Generic mobility: walk; seated heel/toe pumps on long sits or travel >4 h (CDC; Mayo). No prescribed exercise “dose.”
- CDC Travelers’ Health: aspirin is **not** recommended to prevent travel clots; anticoagulants only as the patient’s clinician directed.
- Compression garment type/strength: clinician-directed (Mayo Press). Not specified publicly.
- Chronic swelling differential includes CVI, heart failure, kidney disease, lymphedema (Mayo Press; StatPearls).

### Emergency language kept in the public script

- DVT symptoms → prompt evaluation. CDC: about half of DVT are asymptomatic.
- PE symptoms (sudden dyspnea, pleuritic pain, hemoptysis, syncope) → 911. Don’t wait. Don’t drive yourself.
- CDC: DVT does not cause MI/stroke; arterial thrombosis does. PE is the venous emergency.

## Refused in the public package

- Any start/stop/change of medicines or compression mmHg.
- Causal “walking prevents death / heals ulcers” from S1/S2.
- Clinic conversion CTA. SVS/AVF 2023 full guideline text was not opened this run and is not cited.