ARTIFICIAL INTELLIGENCE FACILITATES MONITORING OF PATIENTS WITH HEART FAILURE IN THE LOVE-HF TRIAL

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<table>
<thead>
<tr>
<th>Baseline</th>
<th>Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>85%</td>
</tr>
<tr>
<td>Specificity</td>
<td>53%</td>
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</tbody>
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### INTRODUCTION:

Early detection of worsening congestion in heart failure (HF) patients can prompt timely interventions and potentially decrease hospital admissions.

- **Standard care recommendations include the monitoring of symptoms and daily weighing at home**
- Of patients do not weigh themselves or monitor symptoms in the 2 weeks prior to admission
- Of admission are associated with peripheral oedema
- Oedema is strongly associated with subsequent prognosis

Is there a missed opportunity for clinicians to respond rapidly to early changes in congestion?

### PURPOSE:

A camera-based technology linked to artificial intelligence software for remote home-monitoring of lower-leg volume was developed, that, unlike daily weights, does not require patient adherence. The main aims of our pilot randomised cross-over trial were to determine the feasibility of data-collection and blinding of randomisation and to estimate event rates to inform the design of future trials of the AI device.

### METHODS:

Single-centre, pilot, double-blind, randomised cross-over trial in patients with HF at increased risk of decompensated HF requiring hospital admission.

- **Screened (204)**
  - Not Eligible (160)
    - 7 Unable to give consent
    - 95 Patient directed
    - 38 Clinician directed
  - Eligible (44)
  - Randomised (X-over) (27)
  - Not Randomised (17)
    - 7 patients died
    - 3 put off by questionnaire
    - 3 felt too unwell
    - 3 moved to a care home
    - 3 didn’t have the device installed whilst the study was briefly paused by REC

### RESULTS:

**PARTICIPANTS:**

27 heart failure patients, median age of 75 years old (63-78), 41% women, 48% with LVEF >50%.

37% of patients weighed themselves during the study on at least half of the days. Median number of days available with weight was 8.5 [0-21.5] days per month.

74% of patients had volume measured on at least half of the days. Median number of days available with volume was 25 [16-29] days per month.

**WEIGHT**

- **Unmonitored Arm**
  - Days over all patients (27 patients, 30 days)
  - Missing Data
  - Days lost to withdrawal

**LOWER LEG VOLUME**

- **Baseline**
- **Alert**
  - Sensitivity / Specificity:
  - Due to the limited opportunities to validate alerts face to face during our study (due to Covid pandemic restrictions), we provide a range for sensitivity and specificity to account for some uncertainty taken from patient reported symptoms and weight over the phone and contradicting information on GP records for example.

**CONCLUSIONS:**

This pilot trial suggests that measurements of leg-volume are more likely to be acquired than weights for patients with HF. Given that weight and symptom monitoring is routinely recommended in HF management, this finding represents a potentially significant improvement over standard care.

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2. Shoaib A et al. 2019

This work was supported by a research grant with funding provided by Heartfelt Technologies: the company which manufactures the AI device. The trial was registered as NCT04787380

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**Example of lower leg swelling detected:** The swelling for this patient developed over a few days, yet they didn’t notice it.