**Title:** Assessing the potential for pressure-sensing, connected-health technology to improve implementation of compression therapy.

**Category:** Innovations

**Authors:** Andrew R. Cameron PhD1, Darren Burke PhD1

**Presenting author (age):** Andrew Cameron (38)

**Affiliations:**

1. FeelTect Limited (start-up company)

**Country of residence of authors:** Ireland

**ICC Presentation History:** Has presented at previous ICC meetings

**Preferred mode of presentation:** Oral contribution

**Abstract**

**Introduction:** Monitoring interface pressure during compression therapy is required to ensure safe and efficacious treatment [1, 2]. This work presents the results from early usability and functionality assessments of a connected-health technology for continuous monitoring of compression therapy. The work examines how pressure monitoring can potentially impact a) treatment regimens, b) self-management, and c) assessment of performance metrics during compression therapy.

**Methods:** Device calibration included winding weighted bandages around a series of cylinders of different circumferences and generating known interface pressures in accordance with Laplace’s Law.

Treatment regimen assessment (TRA): a 2-layer compression bandage system (2LCS) was applied to the legs of healthy volunteers with compression assessed over 26-hour time periods.

Self-management assessment (SMA): guided and unguided compression was applied to healthy volunteers by 8 community nurses, targeting pressure ranges of 25-35mmHg, 35-45mmHg and 35-45mmHg at the C, B1 and B positions, respectively. Comparatively, the ability for nurses to remotely guide a healthy volunteer to apply targeted pressure was assessed using adjustable Velcro wraps (AVW).

Performance metric assessment (PMA): remotely monitored data was processed for the purposes of quantifying the performance of compression therapy.

**Results:** TRA: average pressure drops of 20.5 mmHg (±4.8 mmHg), 21.5 mmHg (±9.0 mmHg) and 19.8 mmHg (±4.8 mmHg) were recorded at the C, B1 and B positions after 6 hours of continuous wearing of the 2LCS, which was improved to 13.5 mmHg (±3.5 mmHg), 5.0 mmHg (±5.6 mmHg) and 10.5 mmHg (±0.7 mmHg) for the same period after reapplication (following 20 hours of compression).

SMA: nurses achieved targeted pressure application 17% in the unguided 2LCS group, 46% in the guided 2LCS group, and 78% in the remotely guided AVW group.

TRA: a series of dynamic metrics were calculated showing potential differences between compression products, with metrics including parameters such as amplitude (related to SSI), rate (related to speed of fluctuations), and magnitude (average pressure).

**Conclusion/discussion:** Significant drops in sub-bandage pressure were observed within 6 hours of application of compression, which could potentially be recovered by alerting reapplication. Furthermore, a 4X improvement in the achievement of targeted pressure was achieved using an AVW with remote support versus unguided application of traditional compression therapy. Finally, a series of new metrics were developed for measuring the effectiveness of compression therapy, showing potential differences in behaviour between compression products. This work demonstrates the potential of a wearable compression monitoring technology to not only highlight deficiencies in care, but also to provide a means of supporting actions (e.g. altering compression reapplication and guiding self-management) to ameliorate these deficiencies.

**References:**

[1] Partsch H, Clark M, Bassez S, Benigni JP, Becker F, Blazer V, Caprini J, Cornu-Thenand F, Hafner J, Flour M, Junger M, Moffat C, Neumann HAM. Measurement of lower leg compression in vivo: recommendations for the performance of measurements of interface pressure and stiffness. Dermatol Surg 2006;32:224–33

[2] Ning, Junjie; Fish, John; Trinh, Felix; Abbas, Jihad; Seiwert, Andrew; Lurie, Fedor (2019). Comparison of three pressure monitors used to measure interface pressure under compression bandages. Phlebology: The Journal of Venous Disease, (), 026835551986217–. doi:10.1177/0268355519862178

**Funding:**

Enterprise Ireland, Western Development Commission, EIT Health, Health Innovation Hub Ireland, National Digital Research Centre, FeelTect Ltd.