

# Measuring the Interface Pressure

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# Compression Therapy: What Is the Real World Practice?

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## Introduction

The most current evidence-based practical guidelines for treatment of venous leg ulcers (VLU) give a 1A grade to only one recommendation, which is "In a patient with a venous leg ulcer, we recommend compression therapy over no compression therapy to increase venous leg ulcer healing rate."<sup>1</sup> Several consensus documents recommend 30 to 40 mm Hg interface pressure for compression therapy to be effective in VLU patients. However, in a real-world practice, pressure under the bandages or stockings is rarely measured, and what pressure is actually delivered is unknown. The goal of this study is to investigate the variation in delivered interface pressure in patients with VLU receiving care in a community-based wound care clinic.

## Methods

For 12 months a community-based wound care clinic was provided with a PicoPress® pressure monitor and probes to use in VLU patients during application of compression bandages. This was a part of the quality improvement project, and all of the readings were recorded without patient identification. For the first three months, the nurses who applied bandages were blinded to the measurements; the next six months the nurses were unblinded, and monitored the pressure while applying the bandages. Target pressure of 30 to 40 mm Hg in a graduated fashion was achieved in all cases. During the last three months, random blinded pressure measurements were performed 3 to 6 times by each nurse to ensure that they could deliver a desirable pressure.

## Study

### Community based wound clinic

#### 3 MONTHS

- Nurses applied bandages
- Blinded to pressure measurements
- 163 measurements

#### 6 MONTHS

- Nurses applied bandages
- Unblinded to pressure measurements

#### 3 MONTHS

- Nurses applied bandages
- Blinded to pressure measurements
- 38 measurements

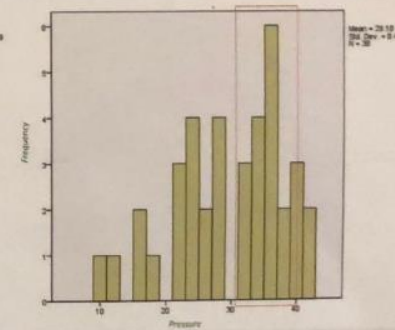
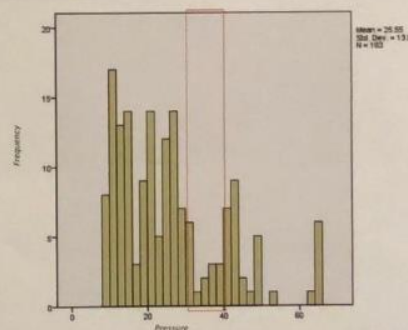
Target pressure 30-40 mmHg

## How we measured pressure



## Results

Seven nurses participated in the study. In the first 3 months, a total of 163 bandage applications were done in 54 patients. Interface pressure varied from 9 mm Hg to 65 mmHg with the mean of  $26 \pm 14$  mm Hg. The median pressure was 22 mm Hg, and the mode was 11 mm Hg. In the last 3 months 38 applications were done in 21 patients. Despite the six months of unblinded bandaging reaching targeted pressure the variability remained high. The mean pressure was  $29 \pm 8$  mm Hg, not statistically different from the first 3 months of the project ( $P=0.1$ ). The median pressure was 32 mm Hg, and the mode was 35 mm Hg. Graduated compression was delivered in 24% of applications compared to 15% during the first 3 months ( $P=0.06$ ). There were no differences among the nurses, but there were significant differences among the patients in the magnitude of the pressure and its variability between applications.



## Conclusion:

In the real-world practice, the delivered interface pressure varies significantly. Pressure monitoring is needed to ensure that desirable dose of compression is delivered to the extremity with VLU.

## References:

- <sup>1</sup>O'Donnell TF Jr, Passman MA, Marston WA, Ennis WJ, Dalsing M, Kisner RL, Lurie F, Henke PK, Gloviczki ML, Eklof BG, Stoughton J, Raju S, Shortell CK, Raffetto JD, Partsch H, Pounds LC, Cummings ME, Gillespie DL, McLaflerty RB, Murad MH, Wakefield TW, Gloviczki P. Society for Vascular Surgery; American Venous Forum. Management of venous leg ulcers: clinical practice guidelines of the Society for Vascular Surgery® and the American Venous Forum. *J Vasc Surg*. 2014 Aug;60(2 Suppl):3S-89S.

# Measuring the Interface Pressure

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Felix Trinh, MD

Compression Therapy: What is the Real-World  
Practice?

# Measuring the Interface Pressure

“Several consensus documents recommend 30 to 40 mm Hg interface pressure for compression therapy to be effective in VLU patients. However in the real world practice pressure ... is rarely measured and the pressure actually delivery is unknown.”

# Measuring the Interface Pressure

First three months nurses wrapped bandages blindly

Followed by six months of applying bandages with measured pressure known

Last and final session three months of again blinded application of bandages

# Measuring the Interface Pressure

Conclusion “In real world practice the delivered interface pressure varied significantly. Pressure monitoring is needed to ensure that desirable dose of compression is delivered to the extremity with VLU.”

Venous edema, leg ulcers & compression therapy

# New Technologies allow measuring interface bandage pressure

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# Multi-Layer Wrap with Smart Sleeve



Sleeve: Terry Cloth  
inner surface



# Multi-Layer Smart Wrap with Smart Sleeve

## 1. Smart Sleeve

Provides light uniform compression approx. 5mmHg  
All compression is controlled by overlying wrap

**Used with any wrap system: MEASURE THE INTERFACE Pressure**

Two Silver thread incorporated vertical electrodes

**Additional sleeve components:**

One Piezoelectric Pressure measuring electrode

One Reader attached by two lead wires



## 2. Elastic Vascular Wrap

Fabric hook (velcro) fasteners



# Multi-Layer Sleeve Wrap System

## 1. Sleeve benefits

- No overlapping fabric inherent with all wraps
  - ▣ No seams
  - ▣ Reciprocating heal →
  - ▣ Friction between sleeve & wrap helps maintain position
  - ▣ Wicks fluid from saturated underlying dressing
  - ▣ Soft terry cushioning (reversible) Nylon-Polyester Blend →
  - ▣ Copper ion - bacteria, fungi, yeast, bed-mites, HIV, influenza, VRE, MRSA, etc.



# Broad Spectrum Antimicrobial Effectiveness

Organism	% Reduction
<b>Bacteria</b>	
<i>Klebsiella pneumoniae</i>	99.9
<i>Staphylococcus aureus</i>	99.9
<i>Escherichia coli</i>	99.9
Meticillin Resistant <i>S. aureus</i> (MRSA)	99.9
Vancomycin Resistant Enterococcus (VRE)	99.9
<i>Pseudomonas aeruginosa</i>	99.9
<i>Acinetobacter baumannii</i>	99.9
<b>Fungus</b>	
<i>Listeria monocytogenes</i>	99.8
<i>Candida albicans</i>	99.9
<i>Trichophyton mentagrophytes</i> (foot fungus)	99.99
<i>Trichophyton rubrum</i> (foot fungus)	99
<i>Aspergillus niger</i>	99.9
<b>Virus</b>	
HIV-1	99.99
Influenza H1N1 (swine flu)	99.8
Influenza H9N2 (bird flu)	99.9

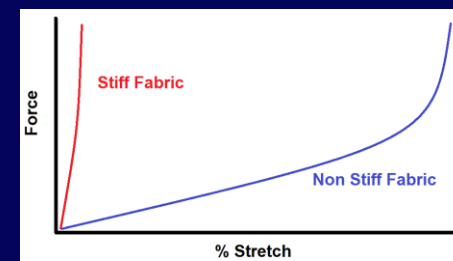
# Multi-Layer Wrap System



## 2. New Vascular Wrap

Specially designed fabric wrap

- ▣ Not occlusive as can be with self-adhesive wraps
- ▣ Wicks fluid
- ▣ Broad range sustained compression levels
  - Utilizes 420 denier spandex
- ▣ “Zig-zag “Z” pattern aids graduated pressure
- ▣ “Smooth” compression level changes even with limb girth reduction as edema reduces unlike Unna Boot, 4 layer wraps
  - —appropriate stress strain curve



# Multi-Layer Wrap Application



# Multi-Layer Wrap Application





# Multi-Layer Wrap Application



# Multi-Layer Wrap Application



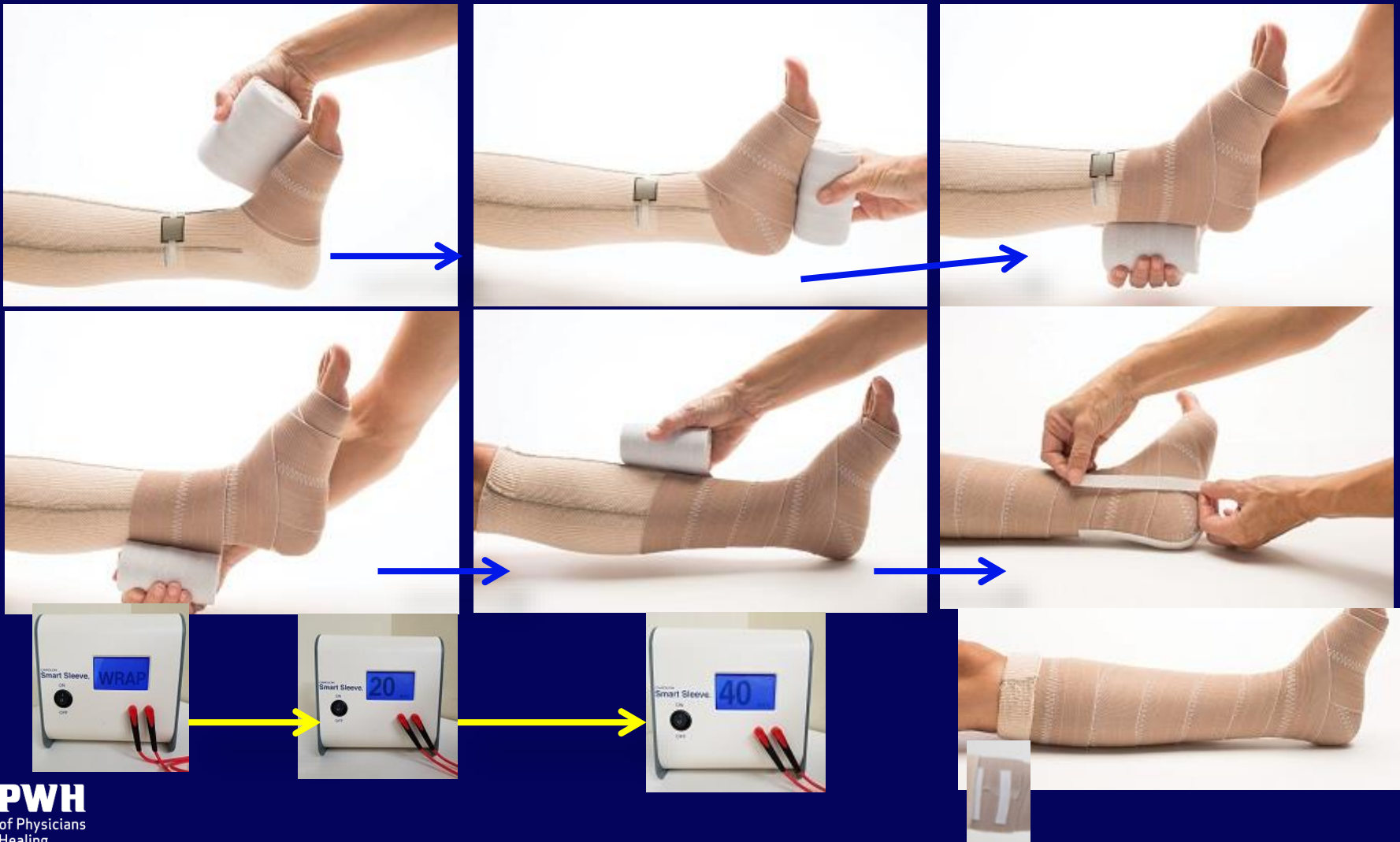
# Multi-Layer Wrap Application



# Smart Sleeve Application

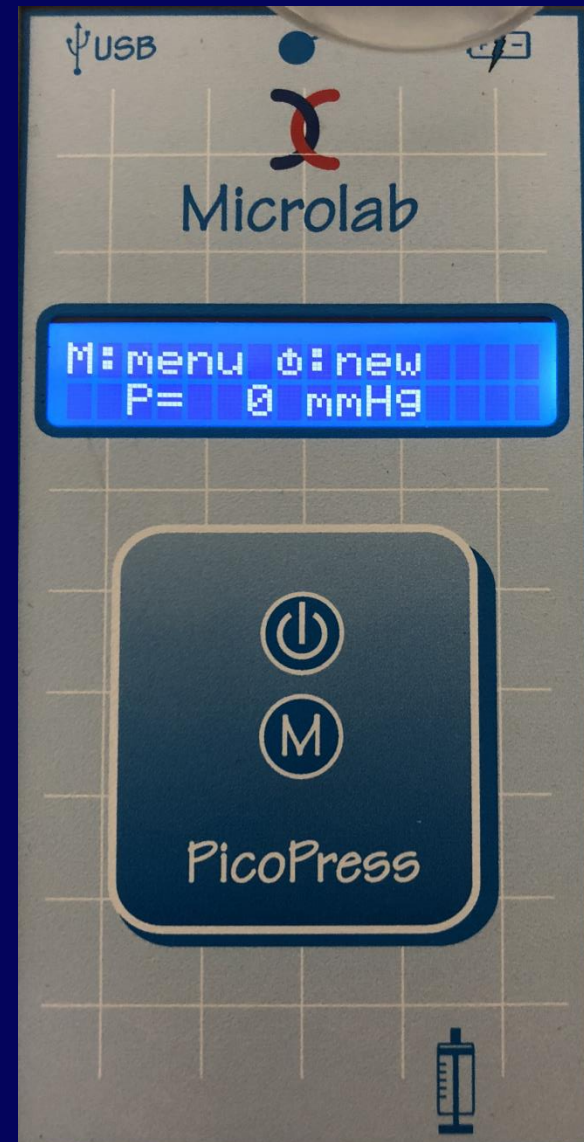


# ML Wrap Application- Measure the interface pressure





# Measuring the Interface Pressure





# Measuring the Interface Pressure

Concluding remarks:

Measuring interface pressure has never been easier to obtain now that several devices available and more will coming to market at prices that are affordable.

# Measuring the Interface Pressure

- ▣ Should measuring interface pressure be recommended?
- ▣ Should it be the standard of care especially with nonresponsive patients and those with bordering ischemia?
- ▣ How can we possibly deliver consistent interface pressure from one treatment session to the next and especially with different providers are involved?

# Measuring the Interface Pressure

Can you think of any other medical standard treatment where dosage is not measured, monitored and adjusted as per patient response?

# Measuring the Interface Pressure

The presentation provides a rationale for the medical community to consider going forward and recommend measuring interface pressure with any multilayer wrap system especially for those patients where nonresponsive to prior treatment or bordering on a level of ischemia.

# Measuring the Interface Pressure

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- ▣ **Materials**
- ▣ Smart Sleeve®, Carolon, 601 Forum Parkway, Rural Hall North Carolina, 27045

# Measuring the Interface Pressure

Thank you