Support Surface Standards

Evan Call and David Brienza
Standardized Terms and Definitions

- **Categories**: Reactive or active, powered or non powered, Overlay or integrated bed system, etc.
- **Features**: Air fluidized and Alternating pressure and low air loss
- **Components**: Open/closed cell foam, gel, air, etc.
- **Physical Concepts**: Friction, envelopment, fatigue, immersion, etc.
Measuring Micro-Climate

• Body analog method
  – Measures heat in °C, and Humidity in % RH (relative humidity)
Measuring Micro-Climate

- **Standard Methods**
  - Sweating guarded hot plate, Nicholson Method
    - Measures Watts/meter$^2$ Heat, Grams/meter$^2$ H$_2$O
Immersion Method
Sweating Guarded Hot Plate Method

- Method validated in and unanimously approved (S3I/NPUAP)

Measures equilibrium rates at which heat and moisture pass through surface.

A little history

2001  NPUAP established Support Surface Standards Initiative (S3I) as a task force

2007  Terms and Definitions developed and Validated

2010  S3I is sanctioned by American National Standards Institute (ANSI) through RESNA to develop technical standards for support surfaces

2014  First 4 standards are approved by ANSI

2015? International Organization of Standardization (ISO) creates committee to develop international standards for support surfaces
Overview

- Descriptions of the tests methods
- Results from the validation tests
- Discussion on the relevance of the validation test results
A few more questions

• What are technical standards?
• Who needs them and why?
• How do you use them?
What is a Support Surface?

- A specialized device for pressure redistribution designed for management of tissue loads, micro-climate, and/or other therapeutic functions. (NPUAP 2007)
Categories of Support Surfaces

- Overlay
- Mattress
- Integrated Bed System
- Seat Cushion Overlay
- Seat Cushion
What is a technical standard

Documents that provide

– requirements
– specifications
– guidelines
– characteristics

that can be used to consistently ensure that materials, products, processes and services are fit for their purpose
Heat Leads to Moisture, then Maceration
# Microclimate Management

## Heat Removal & Evaporative Capacity

<table>
<thead>
<tr>
<th>Surface</th>
<th>Dry Flux (W/m²)</th>
<th>Wet flux (W/m²)</th>
<th>Total Heat Withdrawal (W/m²)</th>
<th>Evaporative Capacity (g/m² * hr)</th>
<th>Est Sacral Skin Cooling relative to Foam (F)</th>
<th>Est Skin Temp (F)</th>
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</thead>
<tbody>
<tr>
<td>AFT @ 88°F</td>
<td>126.2</td>
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<td>801.2</td>
<td>~1000</td>
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<td>90.8</td>
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</table>
Body Analog Data

Foam vs Low Airloss

% RH

Minutes

Ambient
Foam
Low Air Loss
## Sweating Hot Plate Data

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<tr>
<th>Surface</th>
<th>Dry Flux (W/m²)</th>
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<th>Evaporative Capacity (g/m² * hr)</th>
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<tr>
<td>LAL #1</td>
<td>75.3</td>
<td>92.6</td>
<td>167.9</td>
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<tr>
<td>SAT</td>
<td>25.5</td>
<td>1.8</td>
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<td>1.2</td>
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<tr>
<td>Foam over Air #1</td>
<td>16.2</td>
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<td>Foam over Air #2</td>
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<td>Foam #2</td>
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<td>2.3</td>
<td>2.9</td>
<td>0.4</td>
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</table>

## S3I Validation Data
Redistribute Pressure
Contours for Immersion
Immersion

• Immersion is a measure of potential cushioning effect
• Depth of immersion is a predictor of total contact area over which a the bodies mass can be distributed
• Contours predispose to immersion, 3.5 cm in photo
Envelopment

- Conformation to the body
- By conforming, the effective load distribution area increases due to more of the load being born by the areas that are hard to reach
Elastic Conformation, Envelopment
Optimized polymer elasticity and geometric design create superior Immersion and Envelopment

- hammocking/tenting are minimized, localized tension is reduced
- The positives of a viscofoam without the negatives
Cushioning Effect

- Test published by the Australians
- Measure IFD at 25% compression
- Measure IFD at 65% compression
- Calculate the ratio of IFD at 25/IFD at 65
- Closer to 1 is better
Immersion
Immersion: How far does the occupant sink in
Mattress Immersion Testing

- More Immersion is better
- Measure of how deep a body can sink into a support surface
- Defines the potential for pressure redistribution
- Can impact Ingress/Egress
  - Maximum Immersion impacts Egress
  - Minimum Immersion impacts Ulceration
Standards Under Development

• Envelopment
• Disinfection and scrub test
• Shear
• Safe Ingress and egress
• Weight capacity
• Bottoming
• What else would help you most
Criteria for validation and acceptance

- Inter and intra-laboratory repeatability
- Differentiate surfaces
- Unanimous in all cases thus far
- Voted on by committee
- Revisions in response to comments