

# Wound Measurement Device



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## Description

The Wound Measurement Device (WMD) is a low-cost and high-precision wound measurement device that offers an option to current low- and high-tech devices. A prototyping platform based upon a commercial cell phone, AT&T Tilt PDA, has been clinically tested. The system uses off-the-shelf electronics and is programmed in C#.

## Background

Chronic wounds such as pressure ulcers, stasis ulcers, and diabetic ulcers are a critical healthcare issue that affects approximately 20% of the hospitalized population in the US. Including home care patients, elders and persons with disabilities, overall estimates of chronic wound care exceed \$20 billion annually.

Current methods and devices for wound measurement are diverse. At the lower end of the spectrum are simple ruler and tracing-based methods which are easy to use, but lack accuracy and involve undesirable contact with the wound. At the higher end are devices using structured light and stereophotogrammetry methods which are accurate and repeatable, but very expensive.

## Goals of the System

- **Low cost.** The cost of this system will be lower than other high tech systems currently on the market.
- **Ease of use.** The system will be usable with minimal training and no specialized knowledge.
- **Non-contact.** Measurement will be taken without placing anything on the skin or wound bed.
- **Time saving.** The total time needed for processing the wound image and retracing (if needed) will be <1min/wound. The system combines wound measurement and photo-documentation into a single step.
- **Portable.** The system will be hand held and battery operated.
- **Reliability.** The system offers increased intra- and inter-rater reliability as compared to conventional methods.

## Market Opportunity

Sales of such a device would be primarily to hospitals, nursing homes and home health agencies. Current practice at 90% of these point-of-care locations is to use rulers and transparency traces, techniques with poor accuracy and reliability. The market opportunity for such a system in the US is estimated to be on the order of tens of thousands of units. A full series of product offerings is ultimately envisioned, incorporating the enhanced features mentioned below, which would further expand the overall market opportunity. Low estimates of cost coupled with the device's distinct advantages over current practices suggest attractive margin expectations.

## Competing Devices/Methods

Higher cost systems include:

Software-based systems: Vista Medical, PictZar

Hardware-based systems: MAVIS, ARANZ Medical Silhouette

Most Direct Competition: VisiTrak by Smith & Nephew

Low cost systems include:

Ruler Based Method

Transparency Trace Method

Kundin gauge



Above: Side view of device.  
Below: Device in use with 4 laser points around the border of the wound.



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## Design Features

### Border Detection

- Calculation of wound border is done by an iterative edge detection method
- Surface Area Calculation and Accounts for Skew
- Laser pointers and computer vision techniques permit distance measurement and account for skew
- Distance measurement and known camera properties allow for accurate calculation of area

### Touch Screen Interface

- Permits the user to
  - Identify 4 points on the border or manually trace the wound border
  - accept the area traced
  - modify the wound boundary by dragging the outline using a stylus on the touch screen
  - reject the wound boundary and re-trace the wound manually using the stylus

## Quality of Measurement

### Repeatability

- Based on 20 wound images, 3 clinicians, 2 trials per clinician
  - Intra-rater reliability:  $>0.989$ /rater
  - Inter-rater reliability: 0.986 overall

### Accuracy at Different Distances and Skew Angles

- Based on two B/W shapes with known areas
  - $\approx 2.53\%$  error
- Exceeds those of photography, tracing, and Kundin gauge

## Scalable Functioning

The design lends itself to a variety of products exhibiting additional features. These include, but are not limited to:

- Interfacing software to upload wound pictures onto a PC via Bluetooth or USB connection
- Integration of a wound healing scale such as the PUSH to track wound outcomes
- Addition of spectral imaging of the wound bed to inform clinicians about tissue types within the wound and potential identification of spectral indicators of infection or bioburden.
- Addition of spectral detection of erythema which would be based on the same image acquisition hardware, but different spectral image analysis.
- Depth measurement: the use of a simple line laser may be able to quantify depth
- Integration of a patient management system in which a database of patient and wound information is kept and managed

## Contact Us

For additional information about this technology refer to [http://mobilityrerc.gatech.edu/factsheets/wmd\\_factsheet.pdf](http://mobilityrerc.gatech.edu/factsheets/wmd_factsheet.pdf)

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Main



Please tap four points on the border



Continue

Erase

Above: 4 points on wound border identified  
Below: Auto-tracing based on 4 points.

Main



Refresh

Erase

Save

Area: 14.79 cm<sup>2</sup>

Skew: 6.22deg

PID =109

Pull

30



Below: Expected variability from 4 points based segmentation for two clinicians.

