

Implementation of Wound Assessment Data into a Hand-held, PDA-Based Wound Measurement and Documentation Device, and Evaluation in Clinical Practice

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What is Silhouette™?

Wound measurement is essential in assessing the progress of wound healing. The most commonly used tools include wound tracings, width and length measurements, and digital photography. These methods have been useful in clinical practice but have limitations. Such limitations include lack of accuracy, difficulty of use, and often entail wound contact. More advanced equipment tends to be bulky, heavy and expensive.

To address these short-comings, ARANZ Medical Ltd (Christchurch, New Zealand, www.aranzmedical.com) has employed its experience in medical image processing and laser scanning, developing a non-contact, wound measurement and documentation system, the ARANZ Medical Silhouette™.

SilhouetteMobile™, the point-of-care data capture unit, device combines a digital camera and structured lighting in the form of two laser beams to automatically correct for image scale and skin curvature, allowing rapid and accurate measurements of the wound surface area and depth. The scanner unit plugs into a standard Personal Digital Assistant (PDA) to form a highly portable acquisition device that can be easily held and operated using a single hand.

Comprehensive reports can be generated on the PDA from the collected data. Documentation can include photographic records, serial wound measurements, and other pertinent data, and is customizable for a specific healthcare provider. The report can be emailed for teleconsultation purposes, or archived for long term storage.

SilhouetteCentral™, provides optional database and synchronization capabilities, allowing wound assessment data to be shared between multiple SilhouetteMobile units. Clinicians also can review wound data via the internet using a web interface.

Silhouette is appropriate for clinical trials, hospitals, wound care centers and home health agencies.



Figure 1: ARANZ Medical SilhouetteMobile™ in clinical use.

Introduction

The ARANZ Medical SilhouetteMobile™,[†] wound imaging, measurement and documentation system is a PDA-based computer system for the collection and documentation of image-based clinical wound assessment data. Studies have shown that this system is efficient, accurate and repeatable in capturing quantitative wound dimensional data including surface area and depth measurements. However additional information is clinically important to more completely document wound healing progress.

The aims of this project were:

- To identify wound assessment information to be collected by two international clinics.
- To extend the capability of SilhouetteMobile, to include a means for efficiently collecting wound assessment information (Wound Assessment Notes), that will work in varying clinical environments, and save the data directly into an electronic medical record.
- To evaluate this tool in clinical practice.

Method

Wound Specialists in two large home care organizations in two countries, namely the Royal District Nursing Service (RDNS), Victoria, Australia and Nurse Maude Association, New Zealand, independently identified protocols for capturing wound assessment data. Key users then met and reached agreement regarding common data items and those pertaining to the organisations individually. A computerized system was implemented to collect this data.

In order to investigate the accuracy, repeatability and reliability of the SilhouetteMobile technology, wound dimension data was obtained from tracings of images by two clinicians from RDNS and three from Nurse Maude who each captured and traced three images of three wounds "at the bedside" for intra-rater reliability measures. ARANZ Medical SilhouetteCentral™ was then used to "swap" all the images amongst all the nurses who then, remotely using the images only, traced the wounds. The resulting wound dimensional data calculated by the system from these tracings was then analyzed in order to establish inter-rater reliability.

The nurses completed questionnaires regarding the usability and value of the technology, as a clinical tool and as a research instrument, in their respective clinical environments.

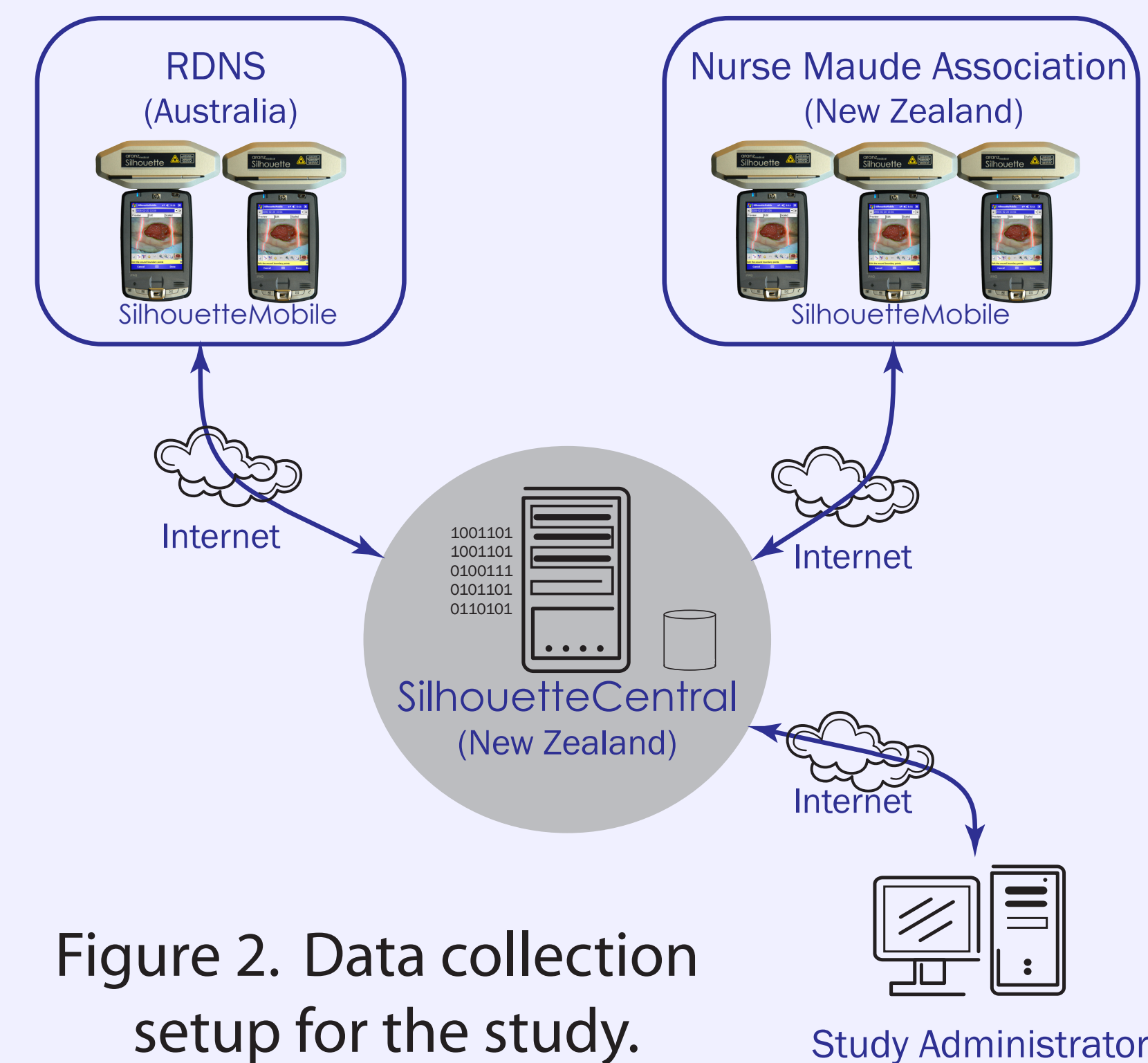


Figure 2. Data collection setup for the study.



Figure 3. ARANZ Medical SilhouetteMobile in use during the study showing: the photograph of a wound onto which the wound tracing has been drawn (left) and an extract from the Wound Assessment Notes (right).

Results

Wound Specialists in the two organizations defined a common specification of data to be collected. This was implemented into the SilhouetteMobile system and named the Wound Assessment Notes. An extract from this can be seen in the right of Figure 3. These notes can be automatically formatted into a printed report, and saved onto the clinic's computer system.

Item analyzes undertaken on rater scores of area measurements revealed very strong reliability, with a correlation coefficient (Cronbach alpha) of .93. Intra-class correlation coefficient for wound tracing scores provided by each of the raters was .93. Inter-item coefficient reliability on scores between the five raters was .83.

A user questionnaire was also completed by the five clinicians, covering dimensions of client acceptability, time to learn the technique, ease of use, and functionality as a research and wound management tool. On a scale of 1 (poor) to 10 (excellent), mean scores ranged from 7.5 to 10, with an overall mean of 9.0. Figure 4 provides examples of comments from the questionnaire and Figure 5 is a summary of the mean scores specific to each dimension.

The results of the reliability analysis and clinician feedback provide strong evidence that SilhouetteMobile is a highly reliable instrument, which is supported by its ease of use as a portable wound imaging device.

Conclusion

The ARANZ Medical SilhouetteMobile was found to be:

- Easy to learn how to use.
- A rapid and efficient means of performing wound measurement and recording of progress notes.
- Accurate and reliable.
- Highly portable.
- A popular alternative to other wound imaging technologies.

In addition to being a useful measurement technique in the community setting, SilhouetteMobile was found to be extremely valuable as a tool to support multicenter research studies in wound care.

[†] ARANZ Medical Limited, www.aranzmedical.com. Patent pending.

Client Acceptability	"Patients very interested and accepting. Able to show slight changes in healing that is very helpful to reassure progress or demonstrate they may need to make a change of their lifestyle e.g., increase exercise or alter diet."
Usability	"Learning how to use Silhouette to take wound images is extremely easy and I can't image this process being any easier."
Speed	"The image captures in a second, this is great."
Wound Assessment	"Excellent tool, accurate, concise and reduces nursing time."

Figure 4 (above). Comments from nurses using the ARANZ Medical SilhouetteMobile relating to particular dimensions in the user questionnaire.

Figure 5 (right). Dimensions of the user questionnaire with the associated mean score.

Dimensions	Mean
<i>General</i>	
Client acceptability	9.2
Time to learn technique	8.8
Obtaining the image	8.0
Tracing	7.5
Wound measurement report	8.2
Manipulation of device	9.0
Speed	8.5
<i>Clinical</i>	
Wound assessment	9.3
Monitoring healing	9.2
Remote consultancy tool	9.0
Infection control	9.3
Research potential	10.0
Wound management potential	9.0

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