A Portable System for Fast and Accurate Non-Contact Wound Assessment.

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Introduction

Wound assessment is a multi-disciplinary effort with many health care practitioners involved. The wound assessment process requires a range of skills and knowledge including[1]:

a) Knowledge of relevant anatomy and physiology;

b) The ability to identify factors that may interfere with normal wound healing;

c) The ability to collect objective and subjective data;

d) The ability to analyse and interpret the information that has been gained;

e) The ability to identify the patient's problems and needs through discussion.

To achieve the best outcomes for patients, woundcare practitioners need to share common wound documentation and healing indicators[2]. Capturing a wound image as part of the patient record provides valuable information of a wound during the healing process. Augmenting this with measurements of wound area and size allows quantitative tracking of the wound healing progression[3].

Portable devices (cameras/tablets/phones) are now more commonly being used in a range of healthcare settings to assist with collecting data and analysing information. The cameras in these mobile devices can capture images but, in themselves, do not allow measurements to be made. Additionally, when capturing information on these devices there are concerns around ensuring the captured image is correctly associated with the correct patient, as well as data privacy ensuring data cannot be accessed without suitable safeguards[4,5].

The Key Requirements for Assessment Devices

Non-Contact

Planimetry approaches allow linear and area measurements to be calculated from a captured photo. One standard way of achieving this is to place a fiducial marker near to the wound, this marker is then detected in the captured image to provide an image scaling. In general, this marker is a consumable with challenges related to supply, distribution, storage and disposal. There are also unwanted increases in assessment time, especially for larger wounds where placement of the marker becomes difficult. The use of a marker also greatly increases the risk to both the patient and health provider due to the increased contamination risk.

An alternative to the use of a scene marker is to measure the distance from the camera to the scene. This range measurement can then be combined with knowledge of the camera system to provide an image scaling allowing measurements to be made. In the case of SilhouetteLite+ this range measurement is made in a totally non-contact and safe manner.

The use of SilhouetteLite+ ensures that wound imaging is non-contact, and there is no need to apply any form of marker or identifier in the vicinity of the wound. Area measurements can be made simply at the point of capture from a single capture of the wound directly from the portable device. Operation without a fiducial marker placed near the wound also allows multiple cost savings to be made including the costs of supply and distribution of the markers, and disposal costs once removed. More importantly the high medical cost of missing an assessment measurement because of an exhausted supply of markers is totally avoided.

SilhouetteLite+ Operating on an Apple iPhone

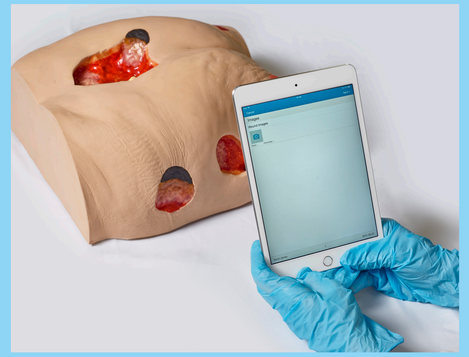
Usability and Portability

Device usability and portability are vital to ensure efficient use by woundcare practitioners. The SilhouetteLite+ system is compatible with a range of Apple iOS devices including iPhone, iPad, and iPod Touch providing flexibility and familiarity in deployment options. This also includes cases where iOS devices are already in use, enabling SilhouetteLite+ to be easily applied by the user and integrated into the existing patient care workflow. Apple devices are commonly used in everyday life and are already used in many hospital and other wound care settings, so many practitioners are accustomed to using and transporting them.

The SilhouetteLite+ sensor attaches discreetly to the rear surface of any modern Apple iOS device either directly or to a protective case. Once attached the sensor awaits operation via the installed SilhouetteLite+ app, communicating via Bluetooth. The SilhouetteLite+ sensor is extremely low power allowing many hundreds of captures before requiring recharging using the wireless recharging station.

Data capture at the point of care using SilhouetteLite+ can be performed with the iOS device offline, any captured data is stored securely on the device then synchronised to SilhouetteCentral once the device is online again and communications established. This allows operation in environments of poor WiFi coverage, or locations away from coverage such as patients' homes.

SilhouetteLite+ Operating on an Apple iPad



Summary of Key Features of Common Wound Assessment Systems

	Portable	Measure Area	No Consumables	Built-in Data Association	Secure	Fast Capture	Part of a Suite of Capture Devices	Wound Notes	Use Existing Device	Range of Form Factors
SilhouetteLite+	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓ Apple mobile devices	✓✓ Phone/Tablet
Fiducial Marker Assisted Device	✓✓	✓✓		✓✓	✓✓	✓	✓	✓✓	✓✓	✓✓
Digital Camera/ Phone	✓✓		✓			✓			✓✓	✓✓
Manual Measuring (paper-based)	✓✓	✓						✓✓		

Data Collection Capability

Documentation of wound healing is essential to record the condition of the wound as well as a vital communication tool that should be accessible to all professionals involved in the management of the patient[1]. The photographic records of a wound over time helps woundcare providers to assess healing over time.

The SilhouetteLite+ sensor complements the high-quality camera contained in the iOS device allowing non-contact area measurements to be made from the wound image captures using the SilhouetteLite+ app. This app also allows detailed notes of both the patient and wound to be captured alongside the wound measurements. All data can then be automatically synchronised back to a central repository called SilhouetteCentral in a secure manner.

Data Security and Accessibility

Security of patient data is extremely important and takes on many forms. Not only must data not be lost, it must be stored appropriately and associated correctly with the patient. Images captured using standard digital cameras or the in-built camera apps of portable devices have a high risk of being either lost or associated with the wrong patient. This risk is exacerbated if there is significant time between capture and upload into a data store, especially if multiple practitioners are involved in the various steps. The use of visible patient identifiers in the wound help avoid some of the data association issues but require more consumables and contact with the patient.

Data captured using SilhouetteLite+ is always associated with a patient at the point of capture and does not require any manual association of images to patients. All data stored on the local iOS device and all data synchronised to SilhouetteCentral is performed in a secure manner with a range of safeguards. Patient assessment history can then be analysed in conjunction with assessments captured using other devices in the SilhouetteSuite range of products including SilhouetteLite and SilhouetteStar.

Summary

The SilhouetteLite+ system in conjunction with the suite of Silhouette products allows for wound documentation in a range of settings in a totally non-contact manner using off the shelf Apple iOS devices for ease of use.

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References

1. The elements of wound assessment, Collier, M., *Wound Care Skills Supplement, Nursing Times*, 2003 April, Vol 99, No.3
2. The Evolving Field of Wound Measurement Techniques: A Literature Review, Khoo R, Jansen S. *Wounds* 2016; 28(6):175:181
3. Improving accuracy of wound measurement in clinical practice. Flanagan M. *Ostomy Wound Manage*. 2003;49(10):28-40.
4. Should 'smart phones' be used for patient photography? Chan, N. et al. *Plast Surg (Oakv)* 2016 Spring; 24(1): 32-34.
5. Privacy risks when using mobile devices in health care, Bromwich, M., Bromwich, R. *CMAJ*. 2016 Sept 6; 188(12): 855-856.

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