

## 2015/2016 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **3 July 2015**

### Supervisor Information (First named supervisor will be the contact):

**Supervisor's Name and Title(s):** Helen Lunt, Clinical Associate Professor; Robert Ashford, Director, Medical Illustrations; Stephen Percival, Diabetes Podiatrist; Paul Hansen, Associate Professor.

**Departments and Institutions:** HL - Diabetes Centre, CDHB and Department of Medicine, UOC; RA, Medical Illustrations, CDHB; SP Diabetes Centre, CDHB; PH, Commerce, UO.

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### Research Category (Choose one category only – to be used for judging the students' presentations):

**Clinical x**

**Laboratory**

**Community**

### Project Title (20 words MAXIMUM):

Measurement of 2D wound images: Use of PAPRIKA (pairwise ranking) to develop consensus and consistency around wound image informatics and reporting.

### Project Description:

**Introduction.** The ever increasing ease of capturing digital images has resulted in high volumes of digital wound images being recorded and shared amongst clinicians. These images are captured for a variety of reasons. These include medico-legal documentation, remote sharing of images amongst multidisciplinary clinicians to aid clinical decision making at a distance and also longitudinal image capture with associated metrics, to ascertain whether wound healing is occurring at a rate that is in keeping with the overall clinic setting. Given the ease of capturing wound images, it is perhaps surprising that there is no internationally agreed consensus around image informatics, including reporting requirements.

One recent advance in describing the wound and wound healing relates to our technical ability to determine SA (surface area) using electronic methods. The clinician draws around the wound margin (wound perimeter) with a stylus or similar and the SA is then calculated electronically. Questions such as; how accurate this drawing should be, or where exactly the wound margin should be placed, have not yet been addressed in the literature. Two approaches to digital wound informatics are shown below and they highlight the differences and limitations associated with accurate drawing of the wound perimeter.

Patient Tests Options Doe, John Q 0001 N/A

Patient Setup Clinical Information Reports Insurance

ICD9/CPT Vital Signs Risks Morphology Images

2012.11.14-10.48.27-SN0000.jpg

Discard Import Cancel Save

SilhouetteCentral

m - c Right Foot, Sole Wound A (2012-06-01 10:19 AM) Domain ID 004

Wound Details

Visit	Assessment
2012-08-24	10:29 AM
2012-08-17	10:00 AM
2012-08-10	11:07 AM
2012-08-03	9:28 AM
2012-07-27	10:15 AM
2012-07-20	10:33 AM
2012-07-13	10:07 AM
2012-07-06	10:11 AM
2012-06-29	9:07 AM
2012-06-22	10:01 AM
2012-06-15	9:42 AM
2012-06-08	12:19 PM
2012-06-01	10:19 AM
2012-05-25	11:54 AM
2012-05-18	11:52 AM

Area & Depth (1) Reference (0)

Surface Laser Review

Area: 2.9cm² Perimeter: 65mm  
Max Depth: 2mm Mean Depth: 0mm  
Volume: 0.0cm³

Notes

Baseline Foot Appearance

Wound Aetiology

Medical history

Investigation history

**Aim.** We plan to develop a 1,000Minds questionnaire to determine clinicians' preferences for wound imaging informatics, with a focus on determination of surface area and perimeter reporting. To do this, we will use the decision making tool 1000Minds ([www.1000minds.com](http://www.1000minds.com)), which will include ranking methodology known as PAPRIKA (potentially all pairwise rankings of all possible alternatives) and also preferences, when presented with two possible interpretations of wound images.

**Methodology.** An archive of 20+ lower limb digital wound images will be assembled using the Silhouette image capture system. These images will be weighted towards complex ulcers that might present challenges regarding inter-observer uniformity of reporting. Whilst the Silhouette system's technical point of difference compared to other wound imaging systems is its ability to capture 3-D wound imaging, for the purposes of the current study, the focus will be on 2D image capture. Silhouette is already in use in Christchurch Hospital (Plastics Department and the

Diabetic Foot Clinic) and many other related clinical settings, around New Zealand. Individual wound images will be manipulated, so that the perimeter is drawn in several different ways.

Associate Professor Hansen will lead the 1000Minds are of the project. 1000Minds has been used in multiple other clinical academic settings, both in New Zealand and overseas. Clinician preferences that will be explored include: What is the preference regarding thickness of the perimeter drawing line? At what point does the preference for an accurate perimeter drawing (detailed drawing of a complex polyhedron with a large perimeter as in Figure 2, versus a simple polyhedron as in Figure 1), outweigh the preference for an assessment that is quick to undertake? Is clinicians' preference regarding defining the wound margin at the edge of the granulation tissue or do they prefer to define the margin as being at the edge of epithelialisation? What to do if either of these margins is unclear? This may be the case in the complex diabetic ulcer, where a mix of necrosis, infection and eschar produces a wound without a clearly demarcated margin? Can **you** clearly define the wound margin in the image below?



A further clinical concern with any wound imaging system is the impact of parallax, which occurs if imaging is not taken 'straight on'. This can be especially problematic when imaging curved surfaces such as heel ulcers. These curved surfaces also result in an underestimation of SA using conventional 2D imaging SA, because the impact of the curvature of the wound on SA is missed in conventional 2D. At what point is the negative effect of parallax and / or curvature on the estimation of SA deemed clinically unacceptable? Is it for example a 5% difference or a 10% difference from the true surface area of the wound?

Each digital image will be presented to the clinician assessor in triplicate, firstly as the plain image (a 'good quality' non manipulated image with parallax minimised), together with a brief clinical back story and standard metrics, then the image will be presented a pair of 'manipulated' images with a drawn perimeter, together with associated digital wound informatics such as surface area and size of perimeter. The clinician assessor then selects their preferred pairwise option from the pair of 'manipulated' images, using the scoring system and associated metrics provided by 1000Minds.

**Role of student.** This project might be regarded as exploratory and it brings together a new interdisciplinary team around a new area of research. The primary objective is the design of a pilot 100Minds questionnaire. The student will help define exact methodology, by seeking out information from both the 1000Minds team and also local (and potentially national) clinical staff.

What is ideal and what is possible / preferred will also be informed by dialogue with medical Illustrations and ARANZ Medical (a Christchurch based vendor). The student will need to possess good communication and project management skills, demonstrate flexibility as project ideas mature and also have a curiosity around working in a new area of data capture.

**Significance.** The immediate significance of this study relates to defining acceptable in-clinic local imaging practices, with a focus on enhancing inter-observer agreement (this is the immediate problem we are trying to solve). Study results are however likely to be national and international interest, as no other institute or health system appears to have formalised agreed quality assessment criteria for digital wound images undertaken by clinicians as part of their routine workflow.

**Student Prerequisites (eg. Medical Student) if applicable:**

This project would be suitable for a medical student, as it will entail working in clinical areas related to wound assessment and management.