FUEL3D™

SBRI support to accelerate the advancement of new healthcare technologies.

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Agenda

Introduction to Fuel3D Technologies Ltd

- **SBRI Development Contracts Phases**
  - **Phase 1**
  - Proof of Concept
  - **Phase 2**
  - Achieving Market Entry
  - Linking to the NHS
  - Framework Contracts
  - **Phase 3**
  - Expand The Benefit To Patients In More Specialities
  - Growth of the company

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Fuel3D technology history..

- Spun out of the University of Oxford in 2006.
- Set up as a micro innovation company of the back of a PHD Thesis.
- 3D handheld surface imaging.
- Refined the technology and looked for practical applications.
- Have conducted 2 phases of SBRI Healthcare Funding.
- Currently Conducting a 3rd Phase.

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Achieving Market Entry

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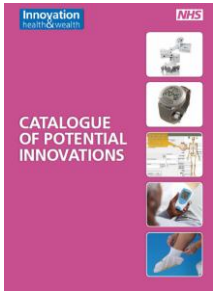
Linking to the NHS

- Small Business Research Initiative (SBRI) Healthcare funding for £600k. 2009/2010/2011 (Phase 1 & 2)
- Competition based on improving chronic wound care led by Health Enterprise East and the regional Strategic Health Authority.
- Product Launched into the NHS in January 2012.
- Very positive effect linking to Department of Health, regional NHS organisations / Hospitals.
- Additional opportunities in the EU.

SBRI HEALTHCARE

health enterprise east IDEAS FOR HEALTH

EAHSN The Eastern Academic Health Science Network



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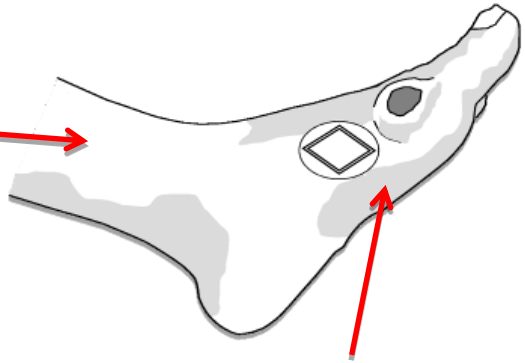
The Wound Imaging System

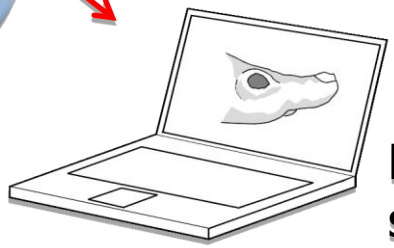
Proprietary camera

Camera and target 'talk'



'Intelligent' disposable target

- Cost effective
- Easy to use



Download, use software to measure and archive

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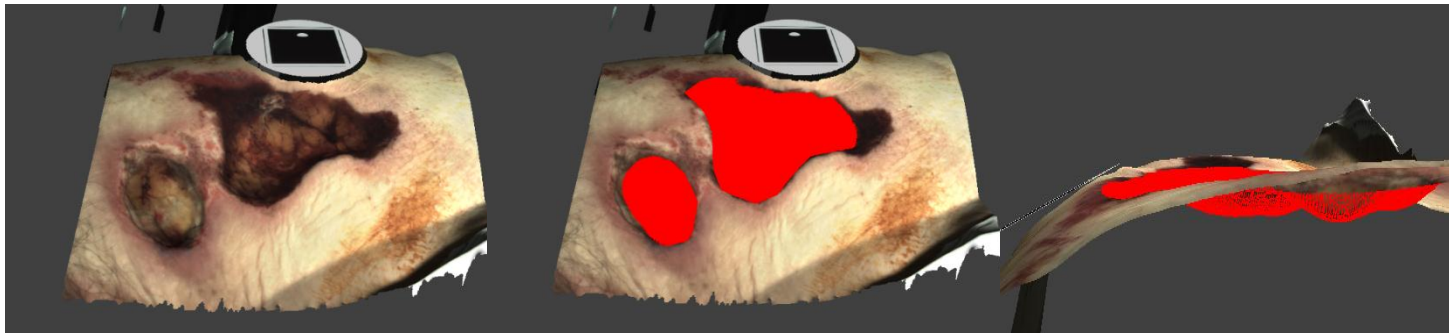
Fuel 3D Functionality

- Simple to use Point & Shoot 3D Scanner & Measurement Software:
  - Records 3D image which can be accurately & repeatedly measured.
  - Track wound volume & area healing over time.
  - Check on treatment suitability & effectiveness.
  - Make quicker & more effective clinical decisions.



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Viewing and Measuring in 3D!

Sinus excision volume automatically calculated as 5873.4mm^3

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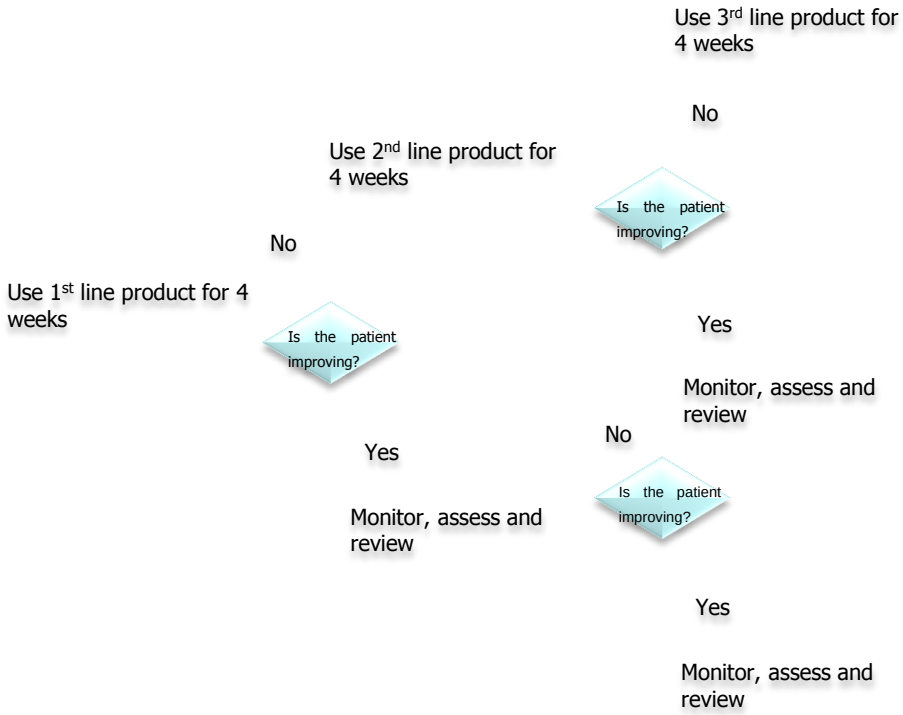
Effective, Accelerated Decisions



Wound management usually depends on a "scaled escalation" treatment plan
The sooner a patient is escalated to a healing treatment, the more cost-effective the episode

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Benefits of the Eykona WMS identified by this study

Use of Eykona 3D Wound Measurement device for clinical assessment of Diabetic Foot Wounds

Yorke M[1], Waller A[1], Crossland V[2] and Bowen G[1]

Background

Wound measurement is a key tool in assessing wound healing[2] and is usually included in clinical guidance and best practice statements for wound management[4]. To date, the most usual methods used in clinic are manual paper ruler, ordinary digital photography, planimetry or "guestimating" which are either highly subjective, have poor accuracy , consistency and reliability or are time consuming.

Increasingly digital wound measurement systems are coming to the market offering solutions to these issues[2]. Eykona Medical Limited have released a 3D wound measurement system ("WMS") that has been shown to address many previous limitations of digital technology and offers good intra- and inter-rater reliability[3].

Aim

This study sought to evaluate the usefullness and applicability of the Eykona 3D Wound Measurement System in a high risk diabetic foot clinic

Method

Since February 2013, patients referred to Solent's Intensive Woundcare Clinic (IWC) have had their ulcers measured with the Eykona WMS.

Fig 1: The Eykona WMS comprising 3D Camera and single use target

The Eykona WMS uses a single use target attached to the foot and in-built features to ensure comparability between images by ensuring the same distance and angle is used each time (see Fig 1).

Photos are then analysed using Eykona software which enables a variety of wound measurements to be calculated including surface area and volume, percentage wound area covered by slough or granulating tissue. Data can also be plotted as a time-graph to allow assessment of progress over time (see Fig 2)

Results

Capturing images was found by the investigating team to be easy and manageable within clinic appointment times although data transfer and subsequent processing initially required a little more time (about 5-10 minutes per photo). Due to internal networking issues, it was not possible to carry out the wound measurement chairside but was done at the end of clinic. This has been a limitation to the trial to date but will soon be remedied. Even with this limitation, use of the graph and other data produced by the Eykona WMS has enabled more accurate and objective monitoring of wound healing status allowing more timely interventions to be provided

Using the graph and other data produced by the Eykona WMS enabled more accurate and objective monitoring of wound healing status by identifying subtle but significant deteriorations in wound healing much earlier and with more confidence than would normally be possible. This in turn triggered a prompt reconsideration of treatment interventions which improved wound management and healing outcomes.

The other key benefit was that output data provided a forum for patient participation and education by enabling clinicians to objectively demonstrate the benefits of compliance and the detrimental effects of non-compliance. Graphical presentation was especially useful for patients who refused to look at their foot/wound.

	22/02/2013	28/02/2013	07/03/2013	21/03/2013	28/03/2013	18/04/2013	25/04/2013	09/05/2013	30/05/2013	04/07/2013	11/07/2013	25/07/2013
	09:19	10:48	09:24	11:50	12:18	09:42	09:12	09:28	10:20	09:13	09:22	09:14
Series1	441.2	226.6	176.3	277.6	226.6	114	61.4	18.3	11.6	0.6	0.3	0

Fig 2: Time graph of wound measurement data

Conclusions

The Eykona system is easy to use, provides objective data on which to base clinical decision; and facilitates communication with both the patient and other members of the multidisciplinary team. The 3D data provides a wide range of information not easily available from traditional wound measurement methods. The system offers not only a tool for active wound management but also potentially can provide timely data for clinical audit and performance monitoring

BENEFITS of the Eykona WMS identified by this study

- provides objective data to support clinical decisions
- reduces the need to rely on memory/clinician's instinct to assess progress
- helps prompt re-evaluation of what is happening to the patient as a whole
- improved communication between team members and with patients.
- the WMS is easy to use and ensures comparability of photos
- data in graph and video format also allows quick and easy assessment of healing progress for both clinicians and the patient
- potential for remote consultations.
- can be used chairside as an educational tool to maximise patient participation.
- offers the potential to assist clinical audit and performance monitoring
- Can be used on Domiciliary visits and downloaded to the patient notes when back at base

LIMITATIONS of the Eykona WMS identified by this study

- apart from the initial financial investment, there are on-going costs of the single use targets.
- to maximise the benefits of data sharing and chair side availability, adequate storage space on the IT network and compatibility with existing systems is needed.
- whilst easy to use, training is needed and speed comes only with practice so initially, additional time for up to 5 minutes per patient would be needed
- At present it is not possible to show only the progression graph with no wound images without extracting this data and creating a separate chart. Some patients do not want to see an image of their wound but would benefit from a visual progression chart as a standalone.

References

1 Bowling FL, King L, Fadavi H, Paterson JA, Preece K, Daniel RW, Matthews DJ and Boulton AJM (2009) An assessment of the accuracy and usability of novel optical wound measurement system Diabetic Medicine 26: 93-96

2 Haghpanah S, Bogie K, Wang X, Banks PG and Ho CH (2006) Reliability of Electronic Versus Manual Wound Measurement Techniques Archives of Physical Medicine and Rehabilitation 87: 1396-1402

3 Gethin G (2006) The importance of continuous wound measuring Wounds UK 2(2): 60-68

4 Davis AJ, Nisimura J, Setzer J, Goodman BL, Ho CH and Bogie KM (2013) Repeatability and clinical utility in stereophotogrammetric measurements of wounds Journal of Wound Care 22(2) 90-97

5 Wounds UK (2008) Best practice statement: optimising wound care Available from http://www.woundsuk.com/best-practice-statements/best-practice-statement-optimising-wound-care [Accessed 30 August 2013]

- **Provides objective data to support clinical decisions.**
- Reduces the need to rely on memory/clinician's instinct to assess progress.
- Helps prompt re-evaluation of what is happening to the patient as a whole.
- **Improved communication between team members and with patients.**
- The WMS is easy to use and ensures comparability of photos.
- Data in graph and video format also allows quick and easy assessment of healing progress for both clinicians and the patient.
- **Potential for remote consultations.**
- Can be used chairside as an educational tool to maximise patient participation.
- **Offers the potential to assist clinical audit and performance monitoring.**
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Framework Contracts

- Following on from SBRI Phase 1 & 2 Contracts:
- NHSSC - NHS Supply Chain (NHSSC) framework
- Eykona introduced to NHSSC by Department of Health in May 2012 via SBRI
- DH recommended a pilot framework contract be drawn up by NHSSC for the Eykona System. To support easier procurement process through NHS.
- **WMS for accurate tracking of wound & scar healing in Over 30 NHS Trusts & Research projects in the UK.**

NHS

NHS Supply Chain

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Gaining Additional Investment

- SBRI Funding was central to attracting additional investor funding.
  - Now more than £10million invested since 2012
- Able to develop non Medical Fuel3D System through a Kickstarter project.
- Now a Phase 3 application



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PHASE 3

April 2014 -

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Key Objectives

1 Year Project to collect Health Economic Data & make adaptions to the System for expanded use:

- Validation of current system with clinicians using the Eykona device
- Explore improvements which would deliver better care and efficiencies
- Understand if there is a wider appeal for a 3D imaging device beyond its current use in wound care
- Establish the potential health economic arguments and outcomes that would need to be considered for product adoption
- Assess and prioritize the adaptations that would need to be incorporated into a modified product for further validation

Fuel3D Project To widen Application for Technology

In depth interviews conducted with 17 clinicians in 8 centres across 8 different disciplines:

- **Disciplines from Maxillofacial surgery, reconstruction**
- **Breast surgery**
- **Prosthetics units**
- **Vascular surgery and wound care**
- **Dermatology**
- **Trauma and burns**
- **Hand surgery**
- **Medical illustration**

Requested Feature Enhancements

- Unit needs to be portable
- Immediate results for on the spot decision making
- Metrics (linear, area, surface, volume)
- 360 models from stitching
- Increased depth measurement accuracy
- 3D report generation in accessible viewer
- Scan surface export
- Targetless scanning
- Larger single shot capture area

Increased depth measurement accuracy

- Higher resolution image capture due to better lens
- Output data decimation will be disabled
- High resolution data available

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Current Clinical Testing

- Fuel3D Scanner was easier to operate than the Eykona Scanner and more lightweight. Stitching was very useful to capture full face.

Ms Witherow Maxillofacial Surgeon St Georges Hospital

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Company Growth

Support from the SBRI Healthcare programme has greatly supported:

- The move from a start-up with 4 staff to a company employing 25. Continuing to expand.

- Allowed for expansion to support patients outside of the UK.

- Generate additional Investment in the company to expand applications.

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Thank you for your time.

Please visit the Fuel3D Stand for Further information during the lunch break.

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