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Office for
Veterans' Affairs

Veterans' Health Innovation Fund Report



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Veterans' Health Innovation Fund

Introduction

For those who have served our nation, the journey doesn't end when the uniform comes off. Every day, veterans across the UK navigate unique healthcare challenges - some visible, others hidden from view. Whether it's managing chronic pain from injuries sustained in the field, adapting to life-changing physical conditions, or dealing with the unseen scars of service, their wellbeing remains our collective responsibility. These men and women stepped forward to protect our way of life; now it's our turn to ensure they receive the innovative care and support they deserve.

In 2022, DASA, on behalf of the Office for Veterans' Affairs launched the "Veterans' Health Innovation Fund" Themed Competition. This competition sought novel innovations to enhance both the physical and mental healthcare provision for veterans.

This report examines three innovative projects funded through the competition, each addressing distinct but crucial aspects of veterans' healthcare:

- **Umio** has developed a pioneering digital solution to tackle chronic pain management - a challenge that affects many veterans' daily lives and their transition to civilian life. Their app provides personalised support not just for veterans, but extends to their partners and families, recognising that pain management is a journey shared by the whole family unit.

- **Radii Devices** is revolutionising prosthetic care through their innovative application, enabling veterans to take control of their prosthetic journey. Their technology allows users to monitor, report, and visualise prosthetic limb fit, creating a vital communication bridge between veterans and their prosthetists.
- **Nu Tissue** is advancing wound care through their groundbreaking E-Plaster® technology. This solution addresses the critical need for rapid and complete wound healing - particularly important for veterans who have experienced blast injuries or trauma. Their innovation promises to transform wound care from a potential barrier to recovery into a manageable, efficient process.

The following pages detail their methodologies, present direct feedback from veterans who have tested these innovations, and outline the crucial next steps in bringing these solutions to those who need them. Together, these innovations represent a significant step forward in veteran healthcare, with each addressing different aspects of the complex healthcare challenges our veterans face.





01

Umio

Helping veterans overcome their chronic pain

Project Investigators

Chris Lawer, Umio

Seonad McHugh, Umio



Development of a novel digital app prototype

With funding from the Office for Veterans' Affairs Health Innovation Fund, Umio successfully researched, designed, tested and developed a prototype app that helps UK armed forces veterans, their partners and families, to overcome their struggles with chronic pain when transitioning to or feeling limited in civilian life.

Aims

The 12 month project sought to:

- Develop a deep understanding of diverse UK veteran lived experiences with pain
- Design a unique pain experience tool and peer support network for veterans to help one another overcome and live better with their pain
- Test the tool and the peer network idea with veterans, gathering their inputs and ideas into the design process
- Build a working prototype and achieve proof of concept of the app, prior to its further funding, development and release for veterans to use.

Method

Umio first undertook in-depth qualitative research with 15 veterans with pain from all three branches of the Armed Forces. It then created wireframes of a novel pain experience interface and app and shared it with 5 veterans to experiment with over a two-week period. With their experiences and positive feedback informing the development of an early-stage interactive prototype, 10 more veterans walked through the app, giving detailed feedback on which features they found most useful, whether they would use it and how often, and how it can evolve. For a summary of the key app features, see the appendix.

Key findings

Umio produced a major research report (Lawer, 2023) into diverse veteran experiences with pain, built the app prototype, and successfully achieved proof of concept. At the end of the project, a report on veteran feedback of the final prototype was also provided to OVA.

The participants saw the potential of the app in numerous ways. They liked the idea of being able to record their experiences, both in order to self-reflect and identify patterns but also to communicate their experiences more clearly to other veterans and those who can help them.

They felt the platform would create a greater sense of community, both through the peer support system of subtle encouragement and through being able to network by locating and engaging with other veterans in local activities.

They liked the idea of being able to look for support for any issues they may have but also being able to provide help and support to others in need, encouraging a sense of purpose and pride.



Key findings continued

They commented upon the fact that a sense of ownership was important, and that they could engage with the process on their own terms. They were positive about the idea of learning to think differently about their pain. The overarching theme, however, was that the app could have a positive effect on their mental health as well as their pain, due to all the previously stated benefits.

Importantly, the app has not been designed to replace but rather enhance existing help that's available to veterans. Its major offer is that it is accessible to all and can be there at any time of the day or night. As such, it can provide an everyday 'small boost' to help veterans along, as well as signpost them to more specialist support when needed.

Outcomes

Overall, the project achieved its objective of proof of concept. The project identified the wide prevalence and diverse experience of hidden persistent pain in veterans, and their desire to overcome their pain to live a fulfilled life as a civilian. Also, it evidenced the need for different kinds of pain support and to tailor it to the specific outlook and needs of veterans and their families.

Given its success, Umio decided to set up a new company – Ooex Limited (www.ooex.co) - to develop and licence the technology to major charities OpCourage and OpRestore veteran health services, as well as veteran bodies overseas in the US and Canada.

Next steps

Ooex is now actively pursuing further grants to develop and trial the app with a bigger cohort of veterans, with a view to integrating the app into existing NHS mental health and pain pathways. Read more about the Ooex veteran app and register your interest at: <https://www.ooex.co/for-uk-veterans-and-families>

Reference

- Lawer, C. (2023) Umio Veterans with Chronic Pain Research Report (Final 20 Nov 2023). Umio Limited. Link to download: <https://umio.io/umio-dl-6>



Umio Created a new company to develop and licence the technology to the NHS, UK veteran agencies and overseas



Appendix – Key App Features and descriptions

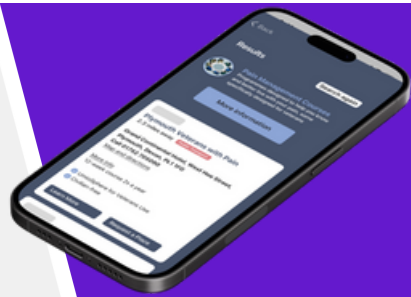
Novel Visual Lived Experience Capture-Expression Interface

Using the app, veterans can capture meaningful experiences for any kind of activity, event or occasion that they do, from gardening to a night at the cinema, from a gentle walk or fast run to a night in the pub; from cooking to just resting. By keeping a record of your experiences on their personal feed, they can learn what works and what doesn't when living with pain.



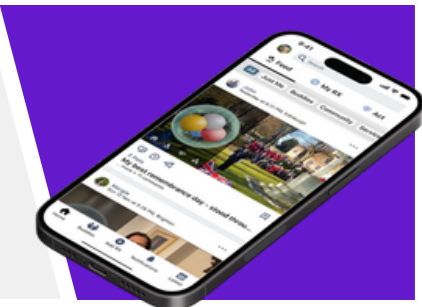
Pain and Wider Lived Experience Learning Engine

Over time, veteran users can discover hidden patterns and trends in their everyday experiences. They can ask the Ooex learning engine for ideas to obtain personalised recommendations for activities, support and resources to help them do and achieve more in their lives.



Veteran Peer-Peer Feed and Support System

Veterans can also connect with their veteran friends to find mates they've lost touch with. They can share useful and meaningful experiences in their veteran group, and exchange support, ideas, and encouragement to push everyone on. Just knowing a friend is there can make a big difference in itself.



Evidenced-based Integrated Acceptance Commitment Therapy Process

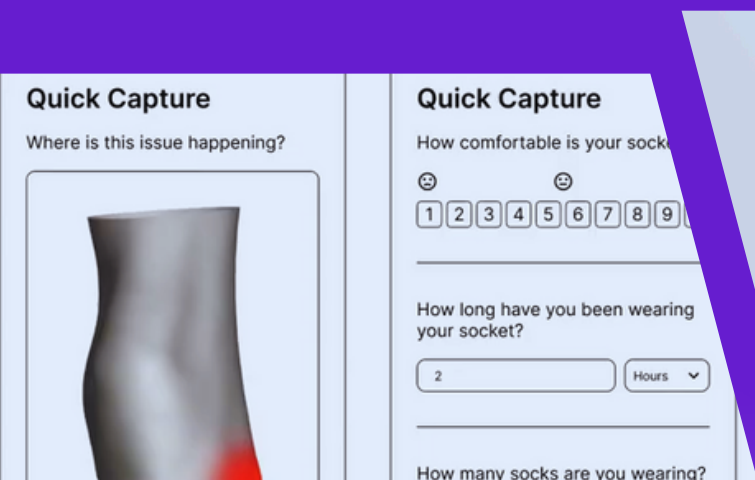
The app contains a bespoke veteran-tailored acceptance commitment therapy (ACT) process designed with the help of a serving Army Major Padre. Scientifically-proven in over 3000 papers, ACT for Veterans is a unique lived experience self-learning process consisting of a series of tools, exercises, videos and actions to help veterans, their partners and families overcome their struggles with pain to realise a more valued, fulfilled life.



Integrated Veteran Activities, Events, Support

Finally, the app helps veterans to find support and things to do near where they live or are located. They can also propose, create, add, organise, and promote their own support, activities and events. As well as this, they can review and record their experience of any support, event or activity undertaken, and share it into the whole veteran network for others to discover and do too.





02

Radii Devices Ltd

Improving residual limb management through prosthetic user reporting with a digital application

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Brian Chenier, BLESMA

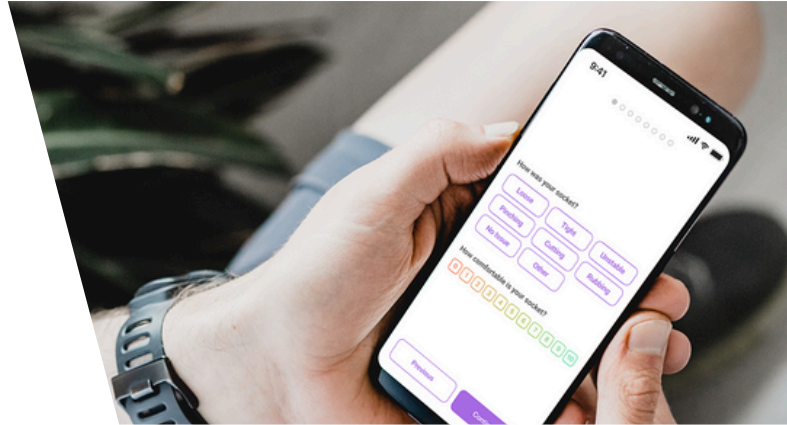


Background to the project

It costs £1m+ to treat each veteran with limb loss (40-year costs, 265 Iraq/Afghanistan veterans with limb loss between 2003-2014; Edwards, 2016). Prosthetic provision for UK veterans reached £9m/year in 2022, with additional cost over an NHS patient of £9k/year and a cumulative caseload of 852 (Murrison, 2011; MoD, 2022).

A well-fitting, comfortable prosthetic socket is vital to a veterans' successful rehabilitation and participation in society. The most common referral in prosthetic clinics is socket discomfort (NHSE, 2018; White, 2016), which reduces physical activity, causes tissue injury, and is the primary cause of prosthetic limb abandonment (Gailey, 2010). Post-amputation, the residual limb undergoes volume fluctuations which can cause significant discomfort (Seminati, 2019), necessitating a replacement socket every ~2 years with socket fitting demanding ~9 clinic visits annually (Nair, 2008).

With socket fit so crucial, patients should be able to communicate their experiences effectively, so this information can help their prosthetist in improving fit, thereby reducing modification time, and improving services. However, patients often find it difficult to achieve effective communication (Murray, 2013).



The project aimed to address these challenges. It was led by Radii Devices, a start-up using software and data to improve fit of skin-interfacing medical devices, in partnership with the Universities of Bath and Southampton, and co-developed with extensive engagement with veteran prosthetic users via BLESMA, the leading charity for veterans with limb loss.

Funding was provided for the 12 month project by the OVA/DASA Veterans' Health Innovation Fund. During this project, 14 Veterans and 6 Clinicians provided input on the app requirements across three cycles of development. Based upon this, a minimum viable product version of the app was developed, which is currently being independently evaluated by 7 prosthesis users.

Feedback from participants demonstrates the potential for the app to be used as a self-management tool for prosthetic users to track long-term residual limb health. This data and tools could be used to reduce the burden on prosthetic services.



Project Aims

This project aimed to develop a minimum viable product version of an app, ready for prosthetic users to take home and evaluate independently.

The application will enable users to manage, report, and visualise key aspects of prosthetic limb fit to communicate with their prosthetist. Anticipated key features and benefits of the app are as follows:

- Improve self-management of prosthetic socket fit through self-reporting of comfort, fit and volume-managing-sock use based upon activity, leading to personalised suggestions;
- Create a more efficient clinical fitting experience using data from a digital record of limb shape change over time and a report for improved communication of issues; and
- Generate ~£7,000 of savings per veteran per year of direct healthcare savings through reduced clinical interactions and indirect societal savings through increased participation.



Methods and Techniques

To fully understand the needs of veterans and clinicians and to develop a digital application which meets those needs, an iterative process was undertaken. To do this a 'Participatory Action Research' (PAR) cycles approach was used. PAR facilitated increased self-determination in developments, and ensured co-production of the app with patients and clinicians (Macdonald, 2012).

The PAR approach in this project utilised qualitative focus groups and cognitive interviews, which asked participants to explain their underlying thought process when testing the app, to achieve this goal across four cycles (Figure 1):

1. User requirements for the system were developed through interviews and focus groups with Veterans and Health Care Professionals.
2. From here, wireframes were created and feedback collected in focus groups to ensure that the user requirements were met by the wireframes.
3. The wireframes were developed into a clickable prototype with feedback collected in one-on-one interviews.
4. Finally, a minimum viable product (MVP) was developed using low-code solutions to enable prosthetic users to access this technology outside the clinic and collect real-world data.



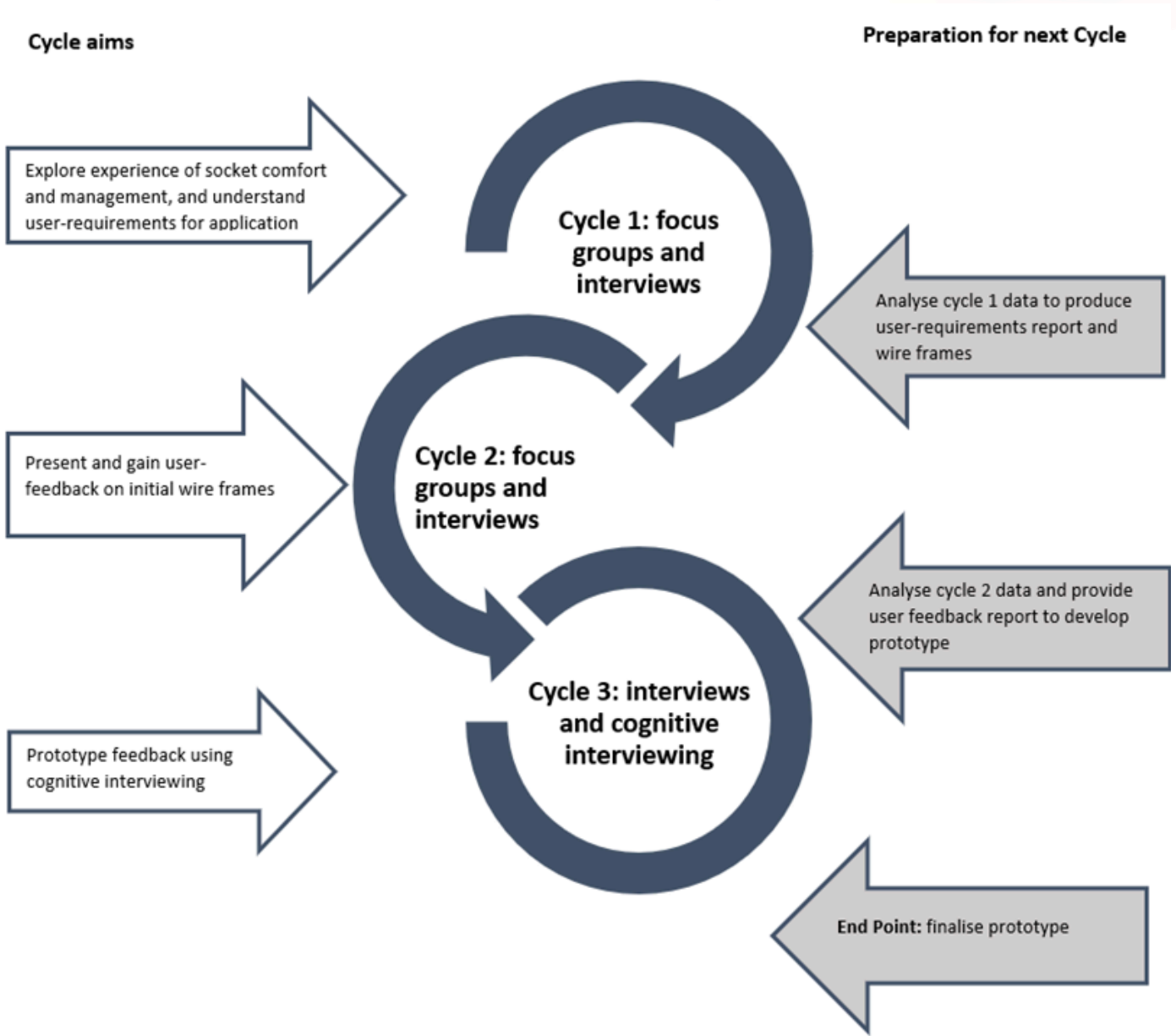


Figure 1: PAR Cycle process for the project.



Results

A total of 14 Veterans (13 Male, 1 Female, age 32-82) and 6 Clinicians in focus groups and interviews across three cycles of development contributed to create user requirements and provide feedback on prototypes. These groups and interviews were recorded, transcribed, and the individual feedback was then categorised. In PAR Cycle 1, 23 user requirements were developed based upon 311 pieces of feedback. 26 topics were then discussed at Cycle 2 based upon 273 pieces of individual feedback. An example of feedback provided is as follows:

“If you’re not capturing issues at the time, you can very easily forget how frustrating or painful it was” – Veteran from a Focus Group.

The primary user requirements for the application were as follows:

1. Ability to record socket and residual limb issues
2. A space for troubleshooting to support self-management
3. Ability to record external factors (activities, climate, illness)

The MVP was built with a low-code platform and deployed as a web app, to enable users to access the app on a variety of platforms.

This enabled rapid production based upon the wireframes and the MVP is currently being tested by 7 participants across 6 weeks for real-world data collection (Figure 2a), this additional activity is funded by Radii and University of Southampton HEIF/FortisNet Grant.

Analysis of the 3D scan data highlighted the variability of volume change post-amputation between participants, with a range of 5-32% reduction in volume from the initial to final scan (Figure 2b).

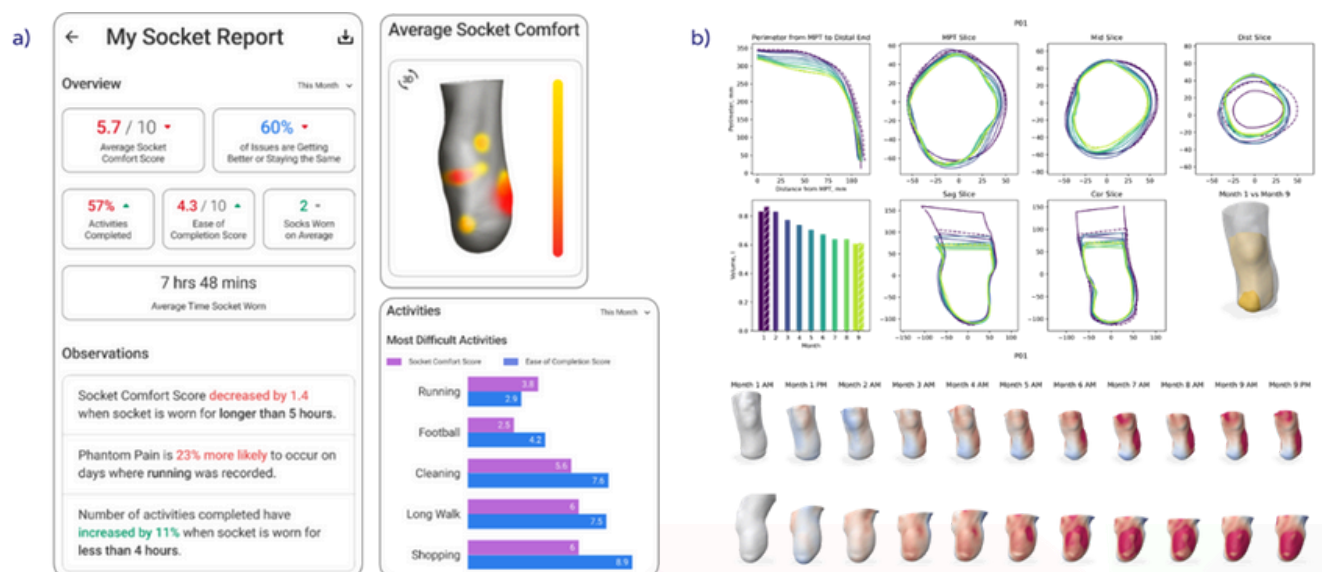


Figure 2: a) Screenshots from the Interactable Prototype. b) Visualisations of the residual limb changing shape and volume over the course of 9 months.

Discussion

This project demonstrated the need for a digital solution to support prosthetic users in self-management of their residual limb and to communicate issues to their prosthetist. Through the PAR methodology, prosthetic users and clinicians were continually empowered across the iterative development process and able to partake in critical decisions between each cycle. This ultimately led to completion of the project aims through the development of an MVP which is currently being evaluated by Veterans.

The iterative approach taken meant that the requirements of the application developed over time far beyond the initial assumptions of the development team. For example, it was initially thought that it would be helpful to provide clinicians with real-time information on the prosthetic user, however, through feedback it became clear this information was only required at the time of the fitting session.

As such, the focus moved to enabling the prosthetic user to generate a report to provide to their prosthetist at their clinical visit. Data from real-world testing will be used to create this report to summarise socket experience and aid clinical communication.

Additionally, the decision to separate residual limb health and socket comfort issues into two separate areas was based upon the input from our participants, who highlighted the need to monitor progression of these two factors independently. These learnings were only made possible by the PAR methodology.

Next steps

This app acts as a companion piece to Ralii's flagship software, riiForm, which uses data from historical best practice to support prosthetists in fitting sockets in the clinic. We are currently evaluating riiForm within three NHS clinics and working towards wider roll-out following the end of the study. Further, Ralii have been contracted by the US Department for Veteran Affairs into a multi-year commercial project to integrate our technology into their digital workflow for 3D printed prosthetics.

The app developed within this project will be used to support riiForm, thereby enabling us to collect more data on an individual's socket fit and comfort experiences to further inform socket designs and shapes that may be successful for different prosthetic users.

Key Outcomes

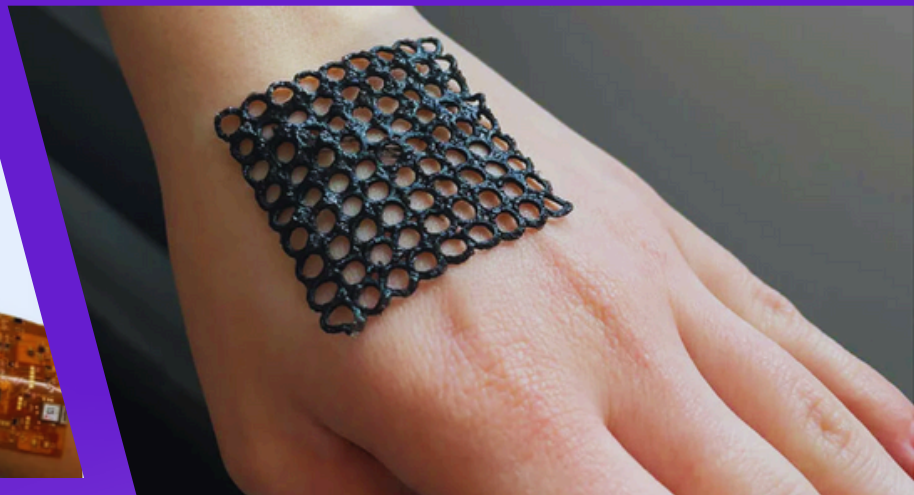
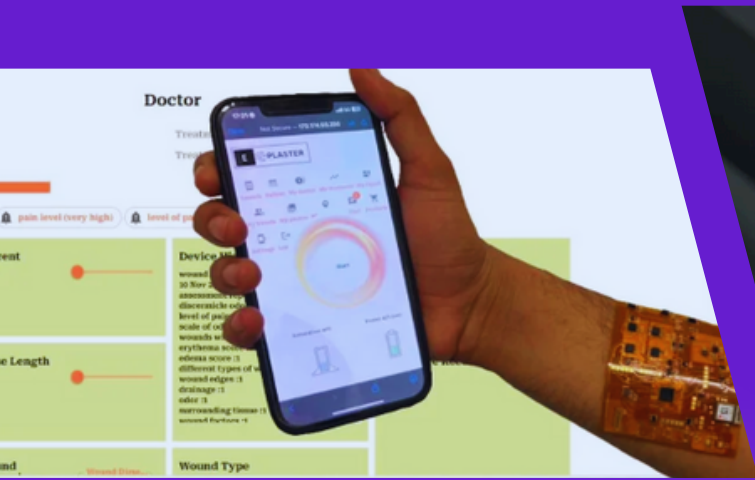
- Development of a Minimum Viable Product through the PAR process;
- Validation from prosthetic users that the application could be used to support self-management of prosthetic socket fit;
- Demonstration of how a digital record of limb shape can be created to quantify change over time;
- Commencement of preliminary real-world testing of the MVP with 7 prosthesis users.



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03

NuTissu Ltd

Rapid Healing of Chronic Wounds: Novel Patch/Dressing to Deliver Electrotherapy



E-Plaster®

NuTissu is developing the E-Plaster® technology, a novel solution designed to rapidly and completely heal wounds while optimizing risk management and improving efficiency in wound care. Wounds can become a burden to military personnel and veterans. Enduring wounds can impact overall physical and mental well-being, and can result in a downward spiral leading to the loss of livelihood/way-of-life. Swift restoration of health, following blast injuries and trauma can restore the wounded individual's resilience and productivity. Wounds in austere conditions can be highly prone to infection leading them to be chronic. Stumps can be prone to infection and linked to complications with prosthesis.

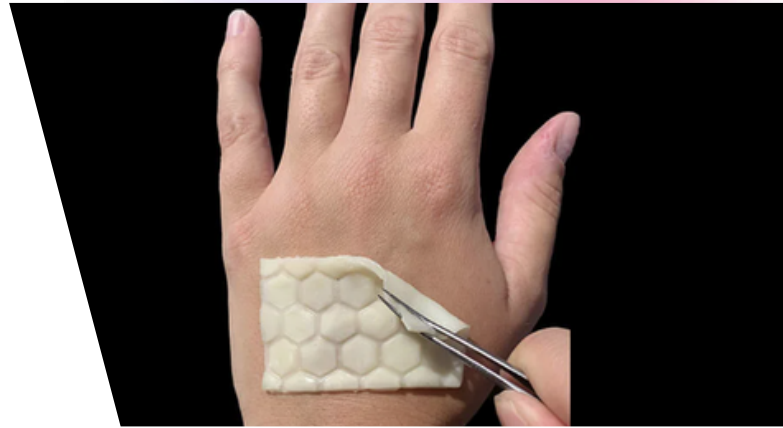
E-Plaster® addresses the challenges posed by infected and chronic wounds, aiming to enhance physical and mental health outcomes through advanced treatment and monitoring technologies.

Aims

The project within Phase 1 aimed to advance the E-Plaster® technology from an early-stage feasibility study to a technology readiness level (TRL) of 4/5.

Specific objectives include:

1. Developing the treatment arm of E-Plaster®, which integrates bioactive materials and electrostimulation therapy (EST) delivered via a flexible, wireless device that connects to the patient's and clinician's personal electronics for treatment and monitoring.
2. Developing the diagnostic/monitoring arm, which includes a digital platform to facilitate patient-centric wound management, allowing patients to log and monitor their healing journey with real-time data access for clinicians.



Methods and Techniques Used

The project employs a multidisciplinary approach that incorporates digital electronics, digital health, and materials technologies, all informed by clinical insights into wound care. The development process includes:

- Integrating bioactive materials with electrostimulation therapy (EST) to enhance wound healing through the application of microcurrents at high voltage.
- Creating a wireless device with a flexible board to deliver and monitor EST, along with bioactive, electroconductive dressings to augment treatment efficacy.
- Developing a digital platform for patient-centric wound management, enabling real time logging and monitoring of the healing process, accessible by both patients and clinicians.



Results

Clinical efficacy of electrostimulation therapy (EST) is well-evidenced and reported. Applying EST to a hard-to-heal wound 'kick-starts' the wound-healing process by reinvigorating these natural bioelectric processes. Innovation with E-Plaster® is to deliver this established treatment in a patient specific, user friendly, and digitally connected with the ability to remotely monitor the state of healing.

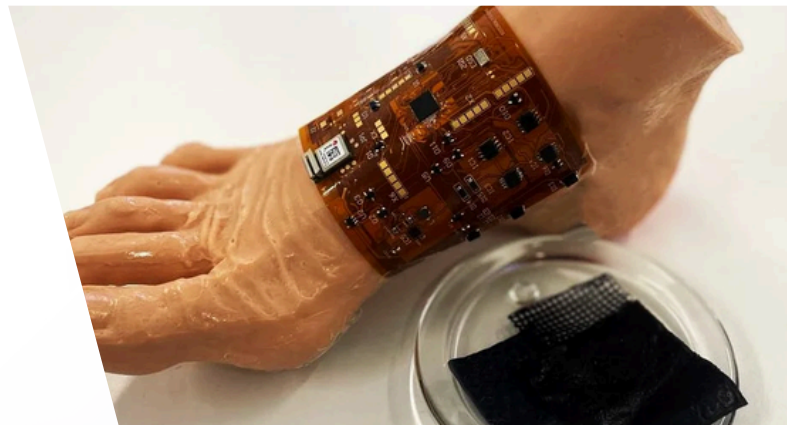
The Health Innovation Award Phase 1 has enabled E-Plaster® to advance to TRL 4/5. NuTissu has manufactured a prototype of a flexible E-Plaster® to deliver up to 50v, up to 5mA. They have developed a functional rigid board design of the E-Plaster® that can deliver 100v up to 3mA. These voltages and currents (50V, 100V, 3-5mA) have shown to be the most therapeutically effective but within a heterogenous wound patient groups. E-Plaster®' digital platform enables application of tunable voltage and current as well as a choice of treatment cycle as a patient specific treatment – which they aim to trial with volunteers.

These results have enabled the SME to plan the addition of human factors, ergonomics with mechanical design considerations for pilots with the core treatment arm to enable them to obtain results with patients following ethics approvals.

A new dressing conformation that combines bioactive and electroconductive materials and have demonstrated in-vitro ability to close a wound as anticipated with results of a laboratory tests that evaluate the rate at which artificially "injured/scratched" layer of cells grow back together.

The digital platform has progressed to TRL6. <https://nutissux.e-plaster.com/> Our user experience up to date with the digital platform is enabling NuTissu to navigate through early stages of go to market activities for E-plaster® where they are addressing the NHS England's digital health technology requirements that would apply to E-plaster® through the wound management platform.

In parallel, work is ongoing to design, identify, and develop a suite of sensors to accompany the core E-Plaster® (which has temperature and humidity sensors) as a connected systems to "see and feel" the status of the wound remotely to facilitate timely wound healing interventions. Technical documentation is being compiled with a view to be considered for European Conformity approvals.



Conclusions

The E-Plaster® technology shows significant promise as a medical device capable of enhancing the UK's ability to treat chronic wounds, prevent acute wounds becoming chronic, and improving the productivity of healthcare providers, whilst delivering broader socio-economic benefits.

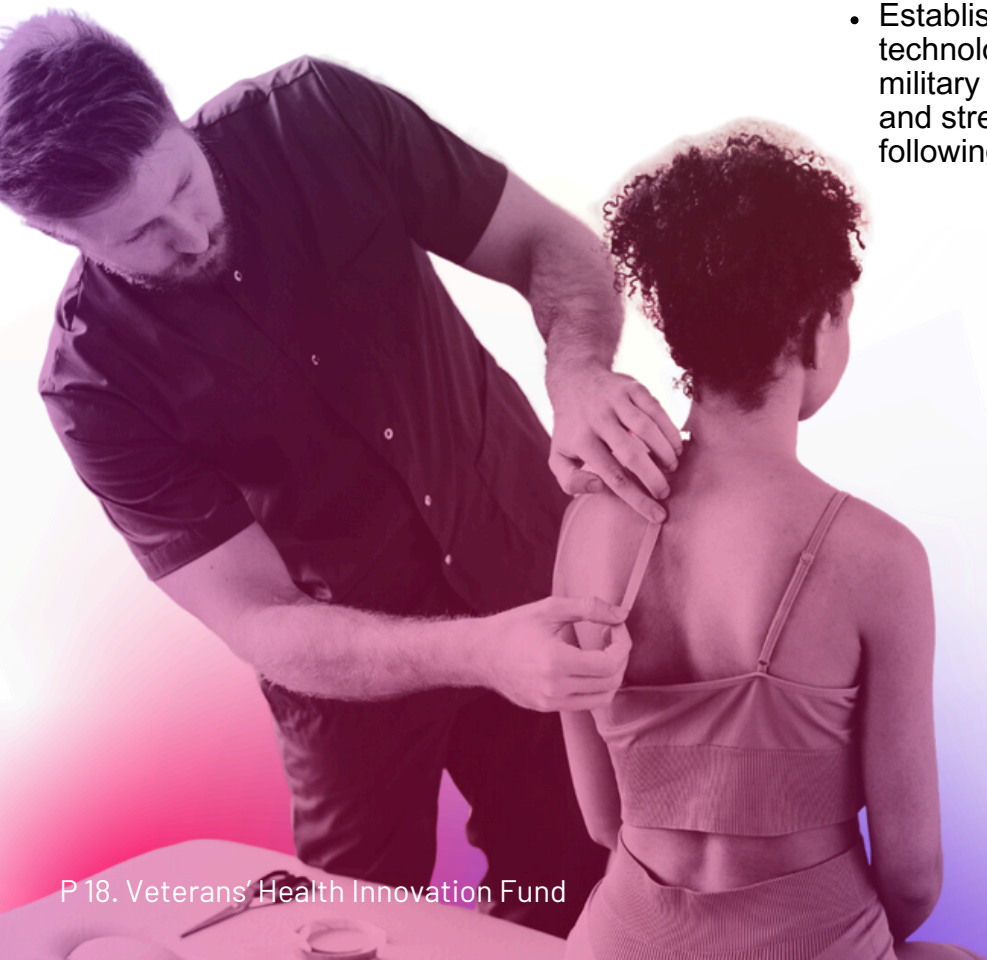
The integration of advanced treatment and monitoring technologies positions E-Plaster® as a potentially transformative solution in wound care, particularly for military and veteran populations at high risk of chronic and infected wounds.

Next Steps

The key next steps involve continuing the development and testing of E-Plaster® and the digital platform to further advance towards commercialization.

This includes:

- Technical developments with the wound sensors integrated with E-Plaster® as a connected device, ergonomics, mechanical design considerations
- Implementing clinical compliance and governance structure (compliance with all DTAC, DSTP and related NHS England's digital health technology, and MHRA requirements) to enable clinical adoption and diffusion within the NHS.
- Completing pilot testing with patients and gathering data to refine the device
- Establish pathways to enable the technology to the veterans and the military and evaluate productivity gains and strength in health resilience following injury



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