

Independent evaluation of **ARMED service:** Final Report

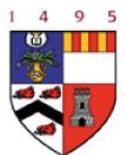
August 2021

Professor Kay Cooper
Professor Heather Fulford
Dr Paul Swinton
Rosie Cooper
Professor Phyo Kyaw Myint
Valery Burnett
Isabelle Harrison
Dr Rachel Moss
Eva Parkinson



Digital Health & Care
Innovation Centre

Commissioned by the Digital Health & Care Innovation Centre





Executive summary

Authors

Professor Kay Cooper, School of Health Sciences, Robert Gordon University.

Principal Investigator & Lead (i) Qualitative review of ARMED, (ii) Landscape Review.

Professor Heather Fulford, Aberdeen Business School, Robert Gordon University. Co-Investigator & Lead (i) Options Appraisal, (ii) Business Model Review.

Dr Paul Swinton, School of Health Sciences, Robert Gordon University. Co-investigator & Lead Quantitative review of ARMED.

Rosie Cooper, NHS Grampian. Co-Investigator.

Professor Phyo Kyaw Myint, University of Aberdeen. Co-Investigator.

Valery Burnett, Isabelle Harrison, Dr Rachel Moss, Eva Parkinson, School of Health Sciences, Robert Gordon University, Research Assistants.

Copyright

Published: August 2021

This report is published by the Digital Health & Care Innovation Centre (DHI) and is subject to copyright. No part may be reproduced in any form without written permission from University of Strathclyde acting through the DHI.

The DHI was established as a collaboration between the University of Strathclyde and the Glasgow School of Art and is part of the Scottish Funding Council's Innovation Centre Programme. The DHI is also part-funded by Scottish Government.



Introduction

ARMED (HAS Technology, Lichfield, UK) is a falls prevention technology that combines a wrist-worn activity tracker with predictive analytics and machine learning to enable early intervention. Data from the tracker is augmented by weekly grip strength and body composition measurements. ARMED-in-a-box is a streamlined version of ARMED that does not use the grip strength or body composition measures, rolled-out in response to the COVID-19 pandemic.

This independent evaluation was commissioned by the Digital Health and Care Innovation Centre and conducted by an interdisciplinary team from Robert Gordon University, the University of Aberdeen, and NHS Grampian. The purpose of the evaluation was to inform the potential for scalability of ARMED within the Scottish digital health and care context, and specifically to analyse and appraise the effectiveness of the current ARMED service and business models, aligning with the national technology enabled care (TEC) programme's existing test of change (TOC) activity.

Methods

We used a multi-method approach, conducted in four non-sequential, interlinked phases, between October 2020 and June 2021. Our planned methods had to be adapted, largely as a result of conducting the evaluation during the COVID-19 pandemic. There was limited availability of data from TOC sites on which to conduct analysis, as a result of delays to projects at these sites due to reprioritisation of local resources during the pandemic. Although additional (non-TOC) sites were initially enthusiastic to participate in the evaluation, they did not provide any data. Recruitment of interview participants was also challenging, due to the smaller than anticipated potential pool of people with experience of using ARMED, and the impact of the COVID-19 pandemic on staff capacity to take part in the evaluation and to assist with recruitment.

Phase 1: ARMED Evaluation comprised quantitative and qualitative components. The quantitative component featured four informal case reports obtained from TOC sites, one scaled-down interim report, and anonymised data obtained directly from HAS Technology evaluating ARMED with 57 older adults. Model based cost-effective analyses were planned but could not be completed due to insufficient data.



The qualitative component featured interviews with 24 staff members from TOC and non-TOC sites that had used ARMED, and four older adults who were users of ARMED. Interviews explored experiences and perceptions of using ARMED to understand feasibility, acceptability, perceived effectiveness and value of ARMED. We also interpreted the interviews through the lens of the NASSS (non-adoption, abandonment, scale-up, spread, sustainability) Framework (Greenhalgh et al, 2017).

Phase 2: Landscape Review comprised a rapid scoping review, informed by JBI methodology, to identify and undertake a high-level assessment of technologies similar to ARMED.

Phase 3: Service deployment model review was conducted in two phases and aimed to identify if there is an optimum service model for the deployment of ARMED, and to assess the current impact and efficiency of ARMED in a real-world setting. Data were interpreted in relation to the innovation-decision process proposed by Rogers (2003) which traces the stages of knowledge, persuasion, decision, implementation and confirmation.

Phase 4: Business model review comprised internet-based searching, information from the HAS Technology white paper, interview data, and an additional interview with a HAS Director. Data were interpreted in relation to the Osterwalder and Pigneur (2010) business model canvas concept (BMC), with the interviews based on questions associated with each of the nine building blocks of the BMC.

Key Findings

ARMED is a novel technology, evidenced by there being few comparable services, with only one highly similar technology identified as being available on the UK market and conforming with the Medical Devices Directive. It therefore has the potential to lead the way in addressing an important and costly health issue (falls), as well as supporting the wider agenda around early intervention and independent living.

We were not able to determine ARMED's impact on falls prevention or to make recommendations on its scalability, due to the lack of available data, owing to the evaluation sites being at an early stage in the adoption decision process. We were able to determine that, in a small sample of users, modest health benefits were suggested for some participants, and that ARMED was generally perceived positively by those users. Both staff and ARMED users viewed ARMED as effective for promoting physical activity, monitoring sleep and facilitating collaboration (staff-to-staff & staff-to-service user). Participants could also see



the potential for ARMED to prevent falls, frailty and hospital admissions, but felt that further development and longer evaluations are required to fully evaluate the impact of ARMED on these outcomes. We identified several positive examples of the use of ARMED in health and care settings, but technical and usability issues and resource requirements suggest that ARMED is not currently suitable for widespread adoption in these settings. The highly staff-intensive nature of ARMED as implemented by the sites included in this evaluation may render its adoption prohibitive for many services.

The service deployment model review identified that ARMED currently faces challenges at the persuasion stage in the adoption decision process, due to issues with compatibility and complexity. Interpretation of the findings through the NASSS Framework lens also identified that there are complicated and complex issues to be resolved before ARMED can be considered for adoption at scale, borne out by the number of sites in our evaluation that had abandoned trials and not progressed to a decision to adopt.

We were not able to recommend an optimal service model for ARMED, in light of the user experiences and stage of adoption at the included sites. Rather, we have made a set of preliminary recommendations for increasing the potential for wider adoption of the ARMED service.

Participants viewed ARMED's emphasis on falls prevention as an attractive value proposition, with potential to deliver cost and time savings and to support self-management and the maintenance of independence. However, the technical difficulties encountered by many of the sites in this evaluation seem to be a key barrier to realising the value of the ARMED service.

We have identified several aspects of the business model that HAS technology could review in order to move towards scale-up, including refining the value proposition for specific customer segments; considering widening the partnership base to include other hardware providers (e.g., trackers/watches); considering the value proposition and business model for ARMED and ARMED-in-a-box, and redesigning after-sales support for delivery at scale and the pricing model.

Recommendations

For Policy

The findings of this evaluation suggest that the ARMED service has potential, but is not currently ready for adoption at scale within the Scottish digital health and



care context. Recommendations are made below for further development of the ARMED service and to increase readiness of services to adopt ARMED, or other similar types of technologies.

Learning generated by conducting this evaluation has informed the recommendation that when pursuing adoption at scale of remote health monitoring technologies such as ARMED, the following should be ensured: (i) the technology has been thoroughly and rigorously tested (and refined where appropriate) with the intended users and in the intended service settings and contexts. We recommend that a checklist is developed for this purpose; (ii) independent evaluation of readiness for adoption should be conducted. We recommend that a standardised assessment is developed specifically for the Scottish Digital Health & Care context; (iii) robust and standardised evaluation designs should be used at each test site to ensure consistency of data for analysis. Specific recommendations for future evaluations are detailed below.

For HAS Technology/ARMED

Recommendation 1

Ways of simplifying the technology aspects of ARMED should be explored to reduce the current challenges of charging and syncing multiple devices, and particularly to reduce the burden on staff and resourcing for deploying ARMED with clients who are unfamiliar with the technology and /or who struggle to gain familiarity and engage with it. This would support adherence and confidence in the technology.

Recommendation 2

Clearer and more user-friendly technical support and guidance on set-up and ongoing use should be provided to all individuals and staff using ARMED, including hardware, software and data management. This guidance and support need to be accessible, timely and appropriate for all users (individuals and staff). Furthermore, thought needs to be given to how this could be provided at scale, and in formats that are most appropriate for each health and care setting. Options that could be explored include a web-based source of information, user manuals/instructions (including video guidance on specific aspects of ARMED set-up and usage), and frequently asked questions on technical issues, with the option of accessing technical support staff where required.



Recommendation 3

Difficulties around accessing and interpreting the data need to be addressed, in order for ARMED users (individuals and staff) to engage in the full functionality of ARMED and for it to be used for its intended purpose i.e., fall prevention.

Recommendation 4

Ways of converting the manual process of uploading grip strength and body composition measures to an automated process should be explored, in order to reduce staff workload and the risk of errors in data entry.

Recommendation 5

The potential should be explored for ARMED to be deployed for a wider range of purposes beyond its initial application for fall prevention. For example, its potential for application among people with learning disabilities living in sheltered accommodation could be further investigated. In pursuing this, care will need to be taken to ensure that the specific value proposition of ARMED for each customer segment is clearly identified and communicated. Likewise, marketing, sales, and after sales processes will need to be appropriately designed for each customer segment.

Recommendation 6

Ways of introducing the ARMED technology gradually to users should be explored in order to ensure they can understand its purpose and be comfortable using it, and in order to increase the likelihood of adoption. Examples of effective strategies could be collected from staff and users, and shared as part of the user guidance and support.

Recommendation 7

The pricing model should be reviewed to ensure that the ongoing costs of using ARMED are not prohibitive to a service adopting it.

Recommendation 8

A clear and distinct value proposition for ARMED-in-a-box should be identified and articulated, with each element of the business model developed for this offering.



Recommendation 9

Eligibility for funding opportunities, should be explored, such as a Management Knowledge Transfer Partnership (KTP), to help refine and robustly test the ARMED business model and prepare the service for delivery at scale.

For Services

Recommendation 1

Services need to allow sufficient time for familiarisation, training, set-up and implementation of ARMED, in order for staff and service users to understand its intended purpose, to feel comfortable using it and to have confidence in ARMED. This is particularly important for service users and staff who are less familiar with technology.

Recommendation 2

Services need to ensure adequate staff resource is available before attempting to implement ARMED in their setting. A dedicated staff member with a remit to lead on ARMED is advisable.

Recommendation 3

Services need to carefully consider the appropriateness of their client group for ARMED, including their ability to interact with the technology and to use it independently, their willingness to use it and their potential to benefit from ARMED.

Recommendation 4

When considering testing ARMED in a service, consideration needs to be given to appropriate baseline measures (e.g., falls rates) and to routinely gathering data that can be used to evaluate the impact of ARMED.

Recommendations for future evaluations

We were able to generate evidence on some aspects of ARMED, such as feasibility and acceptability, but not on effectiveness or cost-effectiveness and we are unable to recommend widescale adoption of ARMED at this time. In order to do so further robust evaluation should be undertaken and should include:

- Standardisation of data collection with agreed valid, reliable and logistically feasible measures to facilitate pooling of data from different sites using ARMED.



- The use of valid measures of the constructs of interest (e.g., physical: balance, mobility; psychological: balance confidence, activity avoidance) which are carefully selected and matched with tests that provide assessment of the construct.
- The use of reliable tests that include minimal variation over short periods of time. Attention should also be paid to implementing protocols to maximise reliability (e.g., timing of tests, instructions provided, equipment used, measurement of multiple tests with averages taken) Prior to roll-out of tests, the scientific literature should be reviewed to determine if tests have appropriate reliability with the population of interest, or pilot testing may be considered.
- The use of measures included in scientific literature, in order for comparisons with similar population and technologies to be made.
- Ensuring that testing batteries are logistically feasible, taking into consideration the physical and emotional stress they place on participants, and that staff have capacity to complete testing batteries at regular intervals. This will enhance compliance and minimise drop-out across evaluation sites.
- Collection of baseline measures (e.g., falls rates) and sociodemographic variables of samples before ARMED is implemented.
- Larger and longer evaluations that are designed to evaluate effectiveness and cost-effectiveness e.g., adequately powered randomised controlled trial comparing ARMED with usual care, with collection of pre-intervention, post-intervention and follow-up measures and cost data regarding equipment costs, cost of support from ARMED, and costs of staff time.
- Comprehensive exploration of barriers to adoption at all levels e.g., technical, service-level, supply chain.