Department for Work & Pensions

Department of Health & Social Care

BACK-on-LINETM Digital technology to keep people with back pain in work

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March 2020

This report describes learning and impact of an Initiative funded by the Department for Work and Pensions Work and Health Unit Health Challenge Fund.

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1. Introduction

1.1 Rationale

Low back pain (LBP) is a common and disabling disorder affecting 65% to 84% of people at some point in their life (Kent and Keating, 2005). In a recent study that examined global disease burden, LBP was demonstrated a single biggest global contributor to years lived with disability (Briggs 2016).

LBP tends to mostly affect those of the working age. In the UK, musculoskeletal (MSK) conditions account for around 23% of sick certification and 21% of long-term incapacity of work (Waddell, 2006) with LBP the second most common reason for sick leave (CBI, 2013). In recognition of this problem the UK government agencies took a stance with health and work the key target for public policy. A multi-agency programme 'working for healthier tomorrow' replaced a sick certification with a 'fit note' that changed focus from what a person cannot do to what a person can do in a workplace. The rates of LBP sickness showed a downward trend since then but MSK pain (principally back pain) is still reported to cost a record 31 million lost working days (Office for National Statistics, 2014) with £14bn bill attached to the UK economy in sick pay (Health and Safety Executive Annual Report 2013-14). In the UK, national health service (NHS) workers are particularly at risk with MSK disorders (predominantly back pain) accounting for 40% of all sickness absence (www.nhsemployers.org). Nursing staff are most affected with 55% reporting LBP at any one time and 77% life time prevalence (Karahan 2009). In a study by Johnson et al (2016) healthcare practitioners (HCPs) were shown to experience LBP at a rate exceeding that of workers in construction, mining and manufacturing (Johnson at al 2016).

The National Institute for Health and Care Excellence (NICE) guidelines for LBP, recently updated in 2016 (NG 59), continue to place the central focus on promoting self-management and advice to remain active and working. Occupational health guidelines for LBP management similarly highlight the utmost importance of providing early information and reassurance about the self-limiting nature of LBP, advice to continue ordinary activities and work or return to work as soon as possible and put processes in place e.g. light duties to ensure rapid return to work (Staal et al., 2003). However, the implementation of these guidelines appears to be at odds with current practice. Anema et al (2002) showed that LBP patients are sick-listed for up to 4 months and conclude that ineffective disability management by occupational health physicians is an obstacle for return to work (Anema et al., 2002). Recent study by Pincus et al (2011) showed that despite the guidelines advising to stay active and at work, many practitioners believe that LBP necessitates work absence and perceive some aspects of work as limited and recommendation for a 'short break from work' to allow healing is common (Pincus et al., 2011). Subsequently the most recent estimates indicate that 41.9% of those issued with fit note for MSK pain disorders (principally back pain) remain on sick leave for 5 or more weeks (NHS Digital, 2017).

Early access to information using innovative education approaches to help people experiencing LBP in work overcome issues such as fear avoidance, physical de-conditioning and improve self-efficacy has been long advocated (Waddell and Burton, 2001). With recent technological advances and digital network accessibility came a growing interest in developing digital interventions offering tailored advice and educational information accessed via a computer, tablet or mobile phone to support self-management. These systems can stand alone or mediate remote access to a health practitioner, offer potentially cost-effective and timely access to evidence-based advice and resources to support self-management.

Several digital support systems for LBP have been developed but the evidence remains weak (Nicholl et al., 2017). Their primary limitations are multiple and include its 'information-dense' format, lack of personalisation and inability to consider individual circumstances, sitting outside of the working environment; accessible either to the 'fully-well' as health and fitness apps unrelated to work, or to

those already reporting to their GP with significant LBP long impacting on work. There is a gap in a high quality, responsive, personalised and adaptable digital system to support people <u>currently in work</u> and experiencing LBP or, free of pain but in high risk jobs and likely to develop LBP in the future (e.g. heavy industry, healthcare etc.).

In attempt to address the gap and limitations of the current digital health technology systems we have developed BACK-on-LINE[™] an online system to support self-management of people with self-reported LBP. The unique element of BACK-on-LINE[™] is that it was developed <u>to support people in work</u> and actively <u>using work activity as a form of return to full function</u>. At the centre of the intervention is BACK-on-LINE[™] self-assessment consisting of 46 questions designed to identify factors likely to be driving person's LBP. Recommended guidelines and techniques directly related to work practices, physical activity and sedentary behaviours as well as clinical expert classification rules on factors contributing to LBP are then applied (Alothman et al, 2017) on the basis of which the user is directed to a self-management package relevant to them. Our group developed BACK-on-LINE[™] self-assessment function with expert consensus (Alothman et al 2017) and established whether it is reliable and whether it is valid in correctly discerning between two different types of LBP (Alothman et al 2019).

The aim of this Initiative was to customise BACK-on-LINETM for the healthcare sector and explore the feasibility and acceptability of BACK-on-LINETM supporting self-management of NHS Wales staff within the largest two NHS Wales Health Boards. Potential impact on LBP, associated disability, physical activity levels, sickness absence, seeking healthcare resources as well as cost of set up, maintenance and support of the BoL platform were also evaluated.

1.2 Outcomes

Primary feasibility outcomes (Table 1.) was descriptive and related to feasibility of BACKONLINE in terms of recruitment and intervention use. Feasibility of recruitment was assessed by counting number of NHS Wales staff accessing BACKONLINE (including the number of participants screened, eligible, consenting, completing the self-assessment). Feasibility of the intervention was assessed by collecting usage data (counting the number of logins, BOL modules accessed, time spent on each page) as well as counting the number of withdrawals from the intervention (ceasing to use BACKONLINE following self-assessment) and retention rates at 4 weeks (at least 1 website visit in 4 weeks).

Additional measures (Table 1) included (1) Baseline demographic data (gender, age, education, employment status, occupation, organisation) (2) BACKonLINE (BOL) acceptability: Assessed using questionnaire based on Technology Acceptance Model (TAM) determining behavioural Intention (BI) regarding the use of BOL intervention, perceived ease of use (PEU) and perceived usefulness (PU), prior experience (PE) and self-efficacy (SE) in using internet and mobile applications. (3) Potential healthcare benefit: Assessed by collecting data on the self-reported use of LBP related healthcare resources (GP visits, medications, attending NHS and/or private physiotherapy or other practitioners) in period 4 weeks period before and after using BOL. (4) Potential work benefit: assessed by collecting self-reported number of sickness absence days for LBP 4 weeks before and after using BOL. (5) Potential health benefit: Assessed using a battery of validated LBP-related outcome measures on pain intensity (visual analogue scale (Kahl and Cleland, 2005), level of disability (Rolland and Morris Disability Questionnaire, RMDQ (Roland and Fairbank, 2000), risk of persistent disability (STarTBacK Tool (Hill et al., 2008). Physical activity levels will be assessed using validated Short Form International Physical Activity Questionnaire (SF-IPAQ) (Craig et al., 2003). Impact on exercise self-efficacy using modified self-efficacy for exercise scale (Resnick and Jenkins, 2000) at baseline and post BOL was also assessed.

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NU	variable	reference	nem	Dergils	Auministration point
1	Recruitment feasibility	Monitoring anonymous usage data (automated data collection)	n/a	Number of individuals: Screened, Eligible, Completing BOL self- ax, Completing 4 week Follow up assessment (retention rates)	4 week follow up
2	Intervention feasibility	Monitoring anonymous usage data (automated data collection)	n/a	Number of BOL accesses (in total and per module), Time spent using BOL (total and per a module), Ave number of log ins to BOL modules per user Ave time spent on BOL modules per user Ave time spent on each BOL module (3 in total) per user	4 week follow up
3	Acceptability	Technology Acceptability Model questionnaire (King and He 2006)	15	Person rates on scale of 5 from strongly agree to strongly disagree questions related to BOL perceived usefulness and perceived ease of use	4 week follow up
4	LBP related healthcare resource use	brief questionnaire developed for this study in BOL self-ax (v1.0, 20/11/2019)	5	LBP resource use measured will include medication use, number of GP visits, other NHS care and private LBP related- therapy costs	Baseline and 4 week follow-up
5	Time off work	Measured with a single item developed for this trial in BOL self-ax (v1.0, 20/11/2019)	1	Patients are asked how much time they have had off work in the past 4 weeks	Baseline and 4 week follow-up
6	Pain intensity	Pain index created by numerical rating scale (Kahl 2005)	2	Person rates their current pain and average pain over the past 2 weeks on 11 point rating scales	Baseline and 4 week follow-up
7	Back pain specific disability	Rolland and Morris Disability Questionnaire RMDQ (Roland and Fairbank 2000)	24	Patients select from a list of items that may describe their experience on the day of scale completion (eg, 'I sleep less well on my back'). The scale is dichotomous, patients select whether the symptom is present or not	Baseline and 4 week follow-up
8	Risk of persistent disability	StarTBack stratification Tool (SBST) (Hill et al 2008)	9	Patents indicate whether they disagree or agree with items covering modifiable prognostic indicators including bothersomeness, disability and mood. Patients are asked to respond thinking about their past 2 weeks	Baseline and 4 week follow-up
9	Physical activity	IPAQ short form (Craig et al 2003)		Patients provide time spent walking, undertaking vigorous and moderate activity, as well as time spent sedentary over the past 7 days	Baseline and 4 week follow-up
10	Exercise self-efficacy	Modified Self- Efficacy for Exercise scale (Resnick and Jenkins 2000)	8	Patients rate how confident they are on a scale between 0 and 10 that they could complete activities suggested by the internet intervention in the face of obstacles such as 'if they felt pain', 'if they were bored' and 'if they were depressed'	Baseline and 4 week follow-up
11	Adherence to BOL specific activities	Items developed specifically for this study	4	Patients are asked about the number of weeks if any they may have walked and/or engaged gentle back exercises. They are also asked estimate of how many days a week they went for walks and/or did gentle back exercises. Patients are also asked if they stopped activities because they no longer are experiencing pain	4 week follow-up

1.3 Targets

We initially targeted NHS Wales workforce in their 2 largest NHS Wales Health Boards (Cardiff and Vale University Health Board and Aneurin Bevan University Health Board. We were able to eventually expand to all 9 NHS Wales Health Boards, Trusts, Health Education Improvement Wales; as well as received

interested from 5 NHS England Trusts and are currently in negotiations to modify and launch BOL to Transport for London (TfL).

1.4 Cost

We delivered this initiative under budget at £168,725.87 from the originally estimated £178,696. The underspend was caused by a range of factors associated with staff leaving the project, project redirection and subsequent re-allocation of resources.

2 What did the Initiative deliver?

2.1 Method statement on the delivery

The Initiative was delivered using a sequential iterative test-and-see co-production design with a longitudinal evaluation of BACK-on-LINE[™] delivery with two data collection points. NHS Wales workforce and Cardiff University staff were our informed expert users, beneficiaries and delivery partners.

The final product of this Initiative was a delivery of BACK-on-LINETM a digital health technology customised to people working in the healthcare sector. It can be accessed via <u>www.backonline.org.uk</u> BACK-on-LINETM is an interactive digital intervention designed to be accessed by people with self-reported LBP in work and with a primary purpose to provide people with accessible <u>work-specific</u> information, techniques and support personalised to them and their occupation. The intervention uses self-regulatory processes such as self-monitoring and feedback all geared towards restoring autonomy in context of their work environment.

The centre of the intervention is a self-assessment consisting of 46 questions about an individual's own account of their LBP, its impact on their work, social, family life, them as person, their physical activity and sedentary habits. Based on responses the user gets feedback on likely LBP contributing factors, sedentary behaviour score, and physical activity score, followed by signposting users to bespoke toolkits specifically designed for healthcare sector containing guidance and techniques relevant to each user profile.

Both beneficiary and employer representatives were fully engaged with the development and delivery of BACK-on-LINE[™] from the outset with their respective journeys as follows:

2.2 Beneficiary journey

Beneficiaries in this Initiative were NHS Wales workforce with self-reported LBP and were involved in development and delivery as follows:

2.2.1 Development

Through our previous development activities related to the self-assessment function we worked with LBP sufferers consulting them on formulating plans for this current Initiative from the outset as part of our Patient and Public Involvement (PPI) strategy. We then recruited additional 7 NHS Wales members of staff reporting to Occupational Health Department with LBP to ensure we were meeting the needs of the Healthcare sector. We adopted a 'rapid prototyping' method whereby we sent bi-weekly iterations of BACK-on-LINETM to the beneficiaries and sought their feedback via telephone interviews and written feedback via emails.

We continued this process till we reached a saturation point (no more new or negative feedback was forthcoming) following 3 iteration-feedback cycles over a 4 week period. This strategy proved highly beneficial and time efficient. The development phase was completed 4 weeks ahead of schedule.

2.2.2 Delivery

Beneficiary journey through BACK-on-LINE[™] involved the following steps:

1. BACK-on-LINE[™] Advertising: reached the beneficiary via advertising and promotional materials (Figure 1.) circulated via all-staff newsletters, emails, signatures of occupational health staff, handing leaflets to staff on wards, in kitchens, canteens and events such as NHS conferences (performed by OH staff).



- 2. BACK-on-LINE[™] Access: Beneficiary clicks on the <u>www.backonline.org.uk</u> link to access the website.
- 3. BACK-on-LINE[™] Welcome page BACK-on-LINE[™] Welcome page (Figure 2.) led the beneficiary to find out about BACK-on-LINE[™] and what it is and how it works.

Figure 2. BACK-on-LINE[™] Welcome page







What is BACK-on-LINE™?

New to BACK-on-LINE™? Please take the *Introduction* module.



Is BACK-on-LINE[™] for me?

Check your eligibility to become a BACK-on-LINE[™] user.



BACK-on-LINE[™] self-assessment

Take the BACK-on-LINE $^{\rm TM}$ self-assessment to find out what may be contributing to your back problem.



Get your BACK-on-LINE[™] score!

View your BACK-on-LINE[™] score and get tailored help for your back problem.

4. BACK-on-LINE[™] Eligibility and Self-screen: A safety measure was built into BACK-on-LINE[™] to ensure the platform is accessed by people likely to benefit (Figure 3.) and help beneficiaries decide whether they should seek medical help for their LBP (Figure 4.).

Figure 3. BACK-on-LINE[™] eligibility



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Your Eligibility

We first need to check whether you are eligible to take part in the study. Please answer the following questions with either Yes or No:

Do you have bacl	k problems	affecting	your job?
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• Yes • No

Are you pregnant or breast feeding?

YesNo

Are you involved in any other back pain research?

YesNo

o No

Are you over the age of 18?

• Yes • No

Do you have easy and regular access to the internet?

• Yes • No

Continue

Figure 4. BACK-on-LINE[™] self-screen



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Low Back Pain Self Screen

We would also like to make sure your back pain isn't caused by anything serious (e.g. joint inflammatory disease, infection, tumour, or a nerve compression) that you should see your doctor for. Please answer the following questions with either Yes or No: Did your back pain start or worsen following a fall? Yes o No Did your back pain coincide with feeling unwell e.g. fever, chills, night sweats (with no other explanation)? Yes o No Do you have altered or loss of sensation around your back passage or genitals (noticeable e.g. when wiping after going to the toilet)? Yes o No Are you experiencing any unexplained widespread weakness in one or both legs or any unexplained trouble walking (e.g. limping, tripping, falling, feeling unsteady on your feet)? Yes \odot No

Do you have difficulty passing or controlling urine or faeces?

 Yes \odot No

- 5. BACK-on-LINE[™] Recruitment: Following eligibility and self-screen, beneficiary progresses to recruitment page to enrol on the feasibility study. They had access to 'Participant information sheet' followed by 'E-Consent' page that incudes optional consent to take part in a focus group/interview.
- 6. BACK-on-LINE[™] E-Consent: Completing the e-consent (Figure 5.) triggers an automated email providing the user with a unique 8-digit username to grant them access to BACK-on-LINE[™] self-assessment

Figure 5. BACK-on-LINE[™] consent





Participant Electronic Consent



To participate in this project you need to confirm agreement with each of the statements below. Please tick each box.

Title of Study: BACK-on-LINE^m: Internet based self-management support system for people with back pain

Name of Researcher: Dr Liba Sheeran

I confirm that I have read and understand the information sheet (date 20.11.2019, version 1.1) for the above study and have had opportunity to ask questions. (required)

I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, and without my medical care or legal rights being affected but any data collected up to the point of my withdrawal will be kept. (required)

🗆 I understand that my details will be linked to a unique identifier to ensure confidentiality. (required)

I confirm that data from the study can be used in the final report and other academic publications and may be presented at conferences, I understand that these will be used anonymously. (required)

You may contact me regarding taking part in a focus group or a telephone interview. (optional)

 I agree for you to share my anonymised data with external collaborators in the UK and abroad, including commercial companies. (optional)

You may contact me in the future to ask if I would be interested in participating in future research. (optional)

I agree to take part in the above study. (required)

By entering your details below you give consent to participate in this study.

Name	First name Last name
Telephone	01234 56789012
Email	address@example.com
Date of Birth	1 \diamond January \diamond 2002 \diamond

Date of consent: March 16, 2020

By pressing the Continue button I agree to take part in this study.



7. BACK-on-LINE[™] self-assessment is made of 46 questions with additional questionnaires collecting employment and health-related outcomes (Table 1, page 5-6) takes approximately 20 minutes to fill in. On completion the beneficiary get an automated email that contains a link to access individualised feedback on type of back pain, physical activity score and sedentary score with links to the intervention modules selected on basis of each person score (Figure 6.).

Figure 6. BACK-on-LINE[™] feedback page



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CA ^E RDY₽	Pensions	Social Ca

Your BACK-on-LINE[™] score

Thank you for telling us about your back pain and how it affects you. Please click on the tabs below to access advice and techniques relevant to your back problem.

Your	back	pain
tyne		

Information to help you understand what may be the underlying problem with your back.

Your physical activity score

Information about whether your physical activity contributes to your back problem.

Your sedentary score

Information about whether your sitting habits are contributing to your back problem.

- You will have access to these pages for 4 weeks so please make the most of it!
- We have sent you an email containing a link to take you directly to this page to access your advice at any time and place convenient to you.

8. BACK-on-LINE[™] intervention: The beneficiary then gains 4-week unlimited access to all the resources relevant to them. They are free to use, access all the information, guidance, animated exercises and quizzes relevant to them for this time period as well as the feedback page. Examples of some pages are in Figure 7.



Figure 7. BACK-on-LINE[™] intervention, examples of various pages

- 9. BACK-on-LINE[™] re-self-assessment: After 4 weeks the beneficiary receives another automated email instructing them to perform the another self-assessment to review their scores together with further post-intervention questionnaires to be used to further improve the intervention.
- 10. BACK-on-LINE[™] interviews/focus groups: Those who give consent are contacted to give in-depth feedback on usefulness and potential benefit of BACK-on-LINE[™] and how it could be improved.
- 11. BACK-on-LINE[™] intervention ends Our aim was to test BACK-on-LINE[™] as an early, personalised, evidence-based and work-relevant <u>brief intervention for people with self-reported LBP affecting</u> <u>their work</u>. If proven effective there would be a potential to explore its additional use during new staff induction and during regular compulsory manual handling training.

2.3 Employer journey

Employers' journey is somewhat simpler but still critical in securing success of BACK-on-LINE[™] reaching potential beneficiaries within their organisation. There are currently two ways to adopt BACK-on-LINE[™] by Employers (1) through participation in research and (2) direct contact with PI (principle investigator, the project lead).

2.3.1 Research participation

Currently BACK-on-LINETM is in its testing and development phase registered as a 'non-commercially sponsored study' on Central Portfolio Management System (CPMS) used for the management of all study records within the National Institute for Health Research (NIHR) Clinical Research Network (CRN) Portfolio. This means that any NHS organisation in Wales and England can express interest in being a recruitment site and open BACK-on-LINETM to their staff between now and November 2020. The process is as follows:

- 1. NHS Organisation contacts PI expressing interest in being a recruitment site, with a named local collaborator responsible for advertising BACK-on-LINE[™] within the organisation
- 2. PI sends 'Local Information Pack' (LIP) to the respective organisation Research and Development (R&D) Office.
- 3. R&D reviews the study and gives Capacity and Capability approval and signs an Organisation Information Document (OID) that serves as a contract between the sponsor (Cardiff University) and the organisation. Given the low set-up costs there is no requirement for costing the interested NHS organisation simplifying the process.
- 4. This renders the site open to recruitment. PI then negotiates with the local collaborator best avenues to promote BACK-on-LINE[™] and provides promotional materials (these are of minimal cost mostly to do with pre-prepared leaflets promoted on staff intranet).
- 5. There is no requirement for the employer to screen, engage or in any way come into contact with the user (potential beneficiary) as all that process is performed online directly on the platform.

2.3.2 Direct contact with PI

Given our promotional and dissemination strategy we also attracted interest of the transport sector, specifically Transport for London (TfL). The set up process involved:

- 1. Negotiating any required customisation of the platform with the Occupational Health Lead, including any costs associated with the customisation covered by the employer.
- 2. Setting up a Collaborative Agreement between Cardiff University and TfL, where TfL given full Rights to use the project outcomes for any purpose and indefinitely and at no cost via Cardiff University owned licence. Cardiff University/DWP to retain all the Rights to the Background BACK-on-LINE technology for use in any future projects.
- 3. Customisation period within which changes are made and the platform is test launched
- 4. BACK-on-LINE[™] launch promoted by TfL

Employer specific data on interest harnessed via BACK-on-LINE[™] (stored and managed by Cardiff University on their secure ARCCA webserver) is available to the employer via an ID protected dashboard containing employer-specific anonymised usage data as well as other outcomes of interest to the employer. The learning from the engaged employers thus far indicates this is of particular interest and is planned to be further developed subject to securing further funding.

2.4 What change was expected

Our expectation was to change: (1) NHS Occupational health and wellbeing service delivery and referral patterns complemented by early LBP prevention and self-management digital support system (2) referral patterns to Occupation health and well-being service within the NHS (3) how NHS workforce (perceived to be expert digital health users) engages with self-care and management of their own musculoskeletal health, principally low back pain, directly within the workplace (4) health outcomes and use of other healthcare resources that workers may typically access to manage their LBP and finally, (5) we hoped to change the impact of LBP on work, in terms of reducing the percentage of people on sick leave and the time spent in work absence due to LBP.

The length of this project and methods used meant that our expectations were not so much about producing the change but assessing and learning from the process of delivering a change, in this case implementing health technology support system BACK-on-LINETM.

2.5 What worked about the delivery

2.5.1 Evidence-based approach

We have used the best current evidence and NICE guidance on management of LBP, utilised theoretical principles underpinning behaviour change, engaged directly with those delivering occupation healthcare and with the beneficiaries and deployed an iterative test-and-see method of delivery to obtain feedback and rapidly drive development and delivery of BACK-on-LINETM - a digital platform offering personalised guidance and techniques to help people to prevent and/or better manage LBP in context of different types of work.

2.5.2 NHS as delivery partners

Delivering the Initiative within the NHS has proved a lengthy and complex process particularly around gaining ethical approval and site access to the NHS employers (occupational health staff) and staff with low back pain. What worked was delivering the development phase 1 on our existing Ethics approval although we still encountered delays in approvals of various amendments to do with this specific project. On reflection, securing a stand-alone ethical approval to develop and run any such Initiative in NHS would have been preferable.

Despite the set up difficulties having the NHS as the development and delivery partner gave the Initiative significant kudos, exposure and credibility. This meant that soon after registering the project on CPMS registry, we had an unprecedented number of organisations from NHS Wales and England very keen to open the project at their site. Subsequently we were able to widen BACK-on-LINETM reach from the original 2 to 16 NHS Wales and England organisations. This includes **all 9 NHS Wales Health Boards and Trusts** and **5 NHS England Trusts**.

2.5.3 Research Governance

Engaging with a delivery partner such as the NHS provides robust processes and framework to follow when developing and testing of new health interventions. Whilst meeting these set processes produced some challenges in terms of time delays and variations across different sites, having a robust research governance framework enhanced the quality and perception of BACK-on-LINE[™] that proved to be critical in bringing more sites/employers on board as well as appearing to play role in the beneficiaries viewing Back-on-LINE[™] in a positive light.

2.5.4 Engaging with beneficiaries, employers and stakeholders from the outset

Early on in the development phase and later in the delivery we maintained contact with engaged and pro-active individuals with LBP and working with the higher education institution sector (Cardiff University) and the NHS. This proved extremely valuable in terms of access to timely feedback resulting in rapid implementation of changes. Early discussions with Welsh Government representatives driving and managing the In-Work Support Initiative led to an invite to the Welsh Health summit where we were able to introduce BACK-on-LINETM to NHS Wales HR and Occupational Health teams. This led to widening our reach across all NHS Wales.

2.5.5 Flexibility and responsiveness in approach

Following our brief introduction of BACK-on-LINETM at the World Congress of Low Back and Pelvic Pain in Antwerp (Oct 2019) we were approached by the Occupational Health and Wellbeing Lead at Transport for London (TfL). We are in the process of drawing up a contract to apply some minor modification to make BACK-on-LINETM suitable to the TfL train drivers who are their particular occupational group they felt would benefit from using our platform. This not only allowed us to draw wealth of learning from setting up and costing modifications to transport sector but also validated our efforts in producing a product that speaks to employers whose workforce is at risk.

2.5.6 Marketing

Engaging with our local NHS Wales partners and wider across the academic sphere proved extremely useful in establishing BACK-on-LINETM visibility, raising profile and local partners' confidence in our Initiative. This helped us to penetrate sites that we previously had not thought of. Our initiative critically fell into the remit and interest of Welsh Government (WG). We also secured Industry links important for realisation of any future ambitions and further development of BACK-on-LINETM.

3 Impact of BACK-on-LINE[™]

3.1 Key Highlights

- BACK-on-LINE[™] had **reached 15 organisations** including Healthcare (11 sites at **NHS Wales and NHS England**), Transport (**Transport for London**) and Higher Education sectors (**Cardiff University**) with potential of reaching total 32,151 beneficiaries likely to experience LBP at work.
- We had been further approached by the **Rail Safety and Standards Board (RSSB)** to apply our research and learning the rail industry. This is obviously extremely exciting news and we are planning to progress with this link further in the coming months.
- To date, BACK-on-LINETM had been adopted and **deployed to all 9 NHS Wales Health Boards and Trusts reaching 17,141 NHS employees** estimated to suffer with LBP affecting their work at any one time. This is over and above our expectations originally set at 2 sites.
- Since its launch on 24 February 2020 (3.5 weeks ago), BACK-on-LINE[™] was accessed by 860 beneficiaries of which 520 checked eligibility, 320 self-screened and 62 individuals became full BACK-on-LINE[™] users with first five individuals due to complete the full BACK-on-LINE[™] intervention 16 March 2020.
- BACK-on-LINE[™] feasibility of set up, reach, engagement, eligibility rates, initial user demographics, and costs had been established.
- BACK-on-LINE[™] acceptability, attrition, potential impact on health- and work-related benefit as well as the qualitative data on user and employer experience will be available 31 January 2021. This is to benefit from the widened BACK-on-LINE[™] reach we had secured in the last month of this Initiative opening the platform to further 14 sites across Wales and England to date and lengthening the recruitment window until 30 November 2020. We are currently exploring the means, support and format of providing DWP with this report.
- Finally, recent developments in Covid-19 and its impact on health service was met with further and unprecedent interest in BACK-on-LINETM. This is because (i) Occupational Health Service in the NHS is no longer able to conduct face-to-face consultations, thus looking recommend an online resource to help their workforce self-managing any rising LBP (ii) Cardiff University staff who had all been required to work from home have poor seating and office set up giving rise to LBP (iii) BACK-on-LINETM offers guidance and exercises that can be performed at home.

3.2 Method statement on how impact was measured

BACK-on-LINE[™] impact was measured by establishing its feasibility, acceptability and potential benefit in terms of health and work-related outcomes. We utilised a longitudinal study design deploying BACKon-LINE[™] across NHS Wales Health Boards and Trusts and collected data from employers and beneficiaries using BACK-on-LINE[™] for 4 weeks at two time points (i) at baseline and (ii) after the 4 weeks of them using the platform.

Data from beneficiaries was collected directly via BACK-on-LINETM designed to integrate the intervention together with the data collection platform. A number of beneficiaries (selected randomly from those consenting) were also invited to take part in a telephone interview or a focus group after

completing the intervention to further explore the beneficiaries' experiences in using BACK-on-LINETM. Data from employers was collected through the employer representatives (occupational health practitioners from the engaged NHS sites) interviews asking about any changing trends in referral patterns to occupational health for LBP and perceptions of BACK-on-LINETM usefulness as a resource potentially embedded within their existing Occupational Health supporting services.

Data on usage is being collected automatically and can be viewed at any time via a BACK-on-LINE[™] dashboard. This includes data on number of visits per a day and on each and every part of the platform (welcome page, eligibility, self-screen, consent) as well as data on number of failed and passed eligibility and self-screens. We are able to quantify (per site) the number of fully recruited BACK-on-LINE[™] users and number of visits they made to each recommended toolbox automatically. We can also monitor the percentage split of back pain type A (nociceptive/mechanical) or B (central sensitisation with dominant psychological factors) based on the BACK-on-LINE[™] self-assessment score, sedentary behaviours and physical activity score, again per each employer site. All this information is collected automatically and accessible at a click of a button at any time.

The follow-up evaluation of the healthcare resource use, disability, work- and pain-related is collected via the platform after 4-weeks of each user engaging with BACK-on-LINE[™]. All participant data is kept in strict confidence and managed in accordance with the 2018 GDPR guidance. Specifically, all data is linked to a randomly generated 8-digit code (username) that the participant is sent via secured automatic email after they provide informed e-consent. All data collected is then linked to this code the identity of which is known only to the PI and currently to JM (software engineer employed on the project who developed the data collection platform site and is actively involved in servicing and maintenance and improvement). All personal data is to be securely destroyed as soon as it is no longer required for the purposes of the study, with the exception of the study consent records which will need to be stored for 15 years in line with Cardiff University's records retention policy.

3.3 Method of evaluation

Primary outcomes of feasibility were evaluated (most available now) descriptively in several ways: (1) counting the number of employers/beneficiaries reached and engaged; (2) counting the number of beneficiaries using BACK-on-LINETM per sector and organisation; (3) determining usage of each component of BACK-on-LINETM per toolkit and per a module; (4) establishing recruitment rate (i.e. percentage of those passing/not passing the selection criteria; (5) establishing attrition rate (i.e. percentage of those dropping out before completion and final assessment); and (6) establishing cost of BACK-on-LINETM set up and data management.

Acceptability (available Jan 2021) is being evaluated using Technology acceptance model questionnaire given to beneficiaries after 4 weeks of them BACK-on-LINE[™].

Potential health- and work-related benefits (available Jan 2021) are being evaluated by calculating a change score in pain intensity, LBP disability, physical activity level, days of sickness absence and use of healthcare resources before and after using BACK-on-LINETM. In addition, correlations between baseline data in pain intensity/disability/physical activity/sickness absence days and website usage/attrition is to be examined to provide an initial indication of potential relationships between personal factors and engagement with the internet intervention and the trial procedures.

The interviews and focus groups have not yet taken place but are planned to be conducted in due course and will be analysed through thematic analysis (Braun and Clarke, 2006). This will involve (1) familiarisation with data; (2) generating initial codes; (3) identifying themes; (4) searching for themes; (5) reviewing themes; (6) defining themes including interpretation; and (7) writing up. An audit trail will

be kept and both coding and interpretation will be cross-checked with the research team. Full iterative process will be used with discussion and reflective feedback to identify discrepancies in the analytic process. NVivo software will be utilised.

3.4 Outcomes and change achieved

Our projected estimate was to deliver BACK-on-LINETM to <u>two</u> NHS Wales healthcare employers reaching 5,204 NHS workers likely to be experiencing LBP in workplace (22% of the total) (Karahan et al 2009) as potential beneficiaries. The conservative estimate was to engage with 10% of those reached (n=502) of which 40% (n=208) would complete the intervention.

In reality, BACK-on-LINE[™] had reached <u>fifteen</u> employers including all nine NHS Wales Health Boards/Trusts, four NHS England Trusts, Transport for London (TfL) and Cardiff University with estimated total of 32,151 potential beneficiaries. Of those 855 beneficiaries engaged with BACK-on-LINE[™] and 62 completed, currently using the platform (Table 2.).

	Benefici-	Benefici-	Benefici-	Employers	Employers	Employers	
	aries	aries	aries	reached	engaged	completed	
	reached	engaged	completed				
Projected	5,204	520	208	2	2	2	
Actual	32,151	855	62	15	9	8	

Table 2. BACK-on-LINE[™] reach and engagement (to 16 March 2020)

3.4.1 Beneficiaries

3.4.1.1 Usage

The main achieved outcome was establishing feasibility of a digital platform such as BACK-on-LINE[™] engaging potential beneficiaries from 3 different sectors (Healthcare, Transport and Education). The full breakdown of beneficiaries per a sector is in Table 3.

Employer	Staff Number	Potential beneficiaries i.e workforce with current LBP (based on 22% point prevalence, Karahan et al 2009)	Beneficiaries reached	Beneficiaries engaged	Beneficiaries completed*
NHS Wales (9 sites)	77,919	17,141	15,236		
Cardiff University	6,600	1,452	1,452	OFF	62
Transport for London	27,000	5,940	0**	625	02
NHS England (5 sites)	34,629	7,618	0**		

Table 3. Breakdown of beneficiaries per sector (to 16 March 2020)

* Users who consented, completed initial self-assessment are using BACK-on-LINETM (first due to complete 16 March 2020).

** Organisations in set stage not yet reaching the beneficiaries

BACK-on-LINE[™] usage enrolment figures since its launch 3.5 weeks ago up to 16 March 2020 are in Figure 8. In summary, BACK-on-LINE[™] was accessed 855 times with 540 individuals proceeding to eligibility and 320 individuals accessing Self-screen. 205 individuals accessed the information about the BACK-on-LINE[™] study and 199 proceeded to consent. Interestingly, 64 individuals were not deemed eligible and 16 had not gained access to BACK-on-LINE[™] as they had not passed Self-screen. 7 individuals asked for more information before taking part. To date 62 individuals became full BACK-on-LINE[™] users with first five due to complete the BACK-on-LINE[™] intervention and final self-assessment mid-March 2020.



Figure 8. BACK-on-LINE[™] enrolment figures (to 16 March 2020)

BACK-on-LINE[™] intervention usage per module is in Figure 9. Of note is that the BACK-on-LINE[™] feedback page was accessed by the 62 beneficiaries over 287 times (average 4.5 times per enrolled beneficiary) with the back pain type page accessed the most (110 times). This may indicate beneficiaries find feedback about the type of back pain a useful resource.

'Getting you back fit for work module' was accessed most frequently (64 times). 'Getting your mind fit for work' was accessed 37 times. Most visited pages were sedentary toolkit and resilient spine toolkit, low activity guidance and how to communicate your LBP to your colleagues and boss (Figure 9.)



Figure 9. BACK-on-LINE[™] intervention usage to 16 March 2020

3.4.1.2 Outcomes

Out of the 62 enrolled BACK-on-LINE[™] users, forty two filled in the BACK-on-LINE[™] initial selfassessment providing the following preliminary evidence of the beneficiary outcomes.

3.4.1.2.1 Demographics

To date, majority of BACK-on-LINE[™] beneficiaries were between 35-54 years old and were females. The latter is likely reflection of females making up a greater proportion of the NHS workforce (Table 4.).

Table 4. BACK-on-LINE [™] beneficiaries demographics (n=42	2)
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Employer	Male	Female	18-24 years old	25-34 years old	35-44 years old	45-54 years old	55-64 years old	65-74 years old	Total
NHS Wales	3	20	2	3	5	8	0	0	18
Cardiff University	5	15	2	6	7	6	3	0	24
Total	7	35	4	9	12	14	3	0	42

3.4.1.2.2 Occupational type

There was an even spread of BACK-on-LINE[™] users' occupational types across the NHS and Education sectors in Wales (Table 5.).

Table 5. BACK-on-LINE[™] beneficiaries (n=42)

Employer	Business &	Clerical &	Education &	Healthcare	Transport &	Other	Total
	Management	Administrative	Training		Logistics		
NHS Wales	4	5	3	7	3	0	20
Cardiff University	1	7	8	3	0	1	22
Total	5	12	11	10	3	1	42

3.4.1.2.3 Employment outcomes

Majority of BACK-on-LINE[™] beneficiaries remained in the same role for at least 13 weeks, indicating that BACK-on-LINE[™] is attracting those for whom it was intended, i.e. experiencing LBP but not necessarily disabled enough to change a role, as well as those likely to be more affected (Table 6.). To date, there were no beneficiaries moving into a new employment or a role, or left job unable to work.

Table 6. Employment outcomes (n=42)

Employer	Moved to a new role and remained in role for at least 13 weeks	Remained in the same role for at least 13 weeks	Total
NHS Wales	5	14	19
Cardiff University	0	23	23
Total	5	37	42

3.4.1.2.4 Time off work because of LBP

Most of BACK-on-LINETM beneficiaries have not had to take time off work because of LBP (n=24) but there were some individuals who did have to take time off work ranging from 2 weeks to 2 individuals in NHS taking 6 months off work or more (Table 7.).

Employer	Never had time off work	Less than 2 weeks	Between 2 – 4 weeks	Between 4 – 6 weeks	Between 6 - 8 weeks	More than 2 months	More than 6 months	Total
NHS Wales	10	3	2	0	1	0	2	18
Cardiff University	14	6	2	1	0	1	0	24
Total	24	9	4	1	1	1	2	42

Table 7. Time off work because of LBP (n=42)

3.4.1.2.5 Duration of current episode of LBP

To date, those beneficiaries who chose to access BACK-on-LINE[™] mostly presented with persistent LBP lasting between 1 day to more than 6 months (Table 8.). This indicates the persistent nature of LBP among workforce choosing to continue to work (Table 6.) indicating potentially presenteeism issue with this condition.

Table 8. Duration of current episode of LBP

Duration	0 – 7 days	8 -14 days	15 days – 1	More than 1	More than 3	More than
			month	month	months	6 months
Number of beneficiaries	5	4	4	10	6	14
(NHS and CU)						

3.4.1.2.6 Beneficiary feedback to date

Feedback we had received from beneficiaries to date had been all positive and constructive allowing us to improve the site whilst it is running. Table 9. contains some examples:

Table 9. Beneficiary feedback to date

- "Very easy-to-follow, timely feedback and guidance. thank you! some functionality feedback: When you go into a module, you can't get back out to the home page. The Home icon takes you to the start of the module not the Home page of the site. There was a question that listed a lot of issues, and there wasn't a "None of the above" option. I ended up saying that "I change position" because I couldn't continue otherwise. (Higher education beneficiary, Cardiff University)".
- *"I received my ID login number and completed the self-assessment. All well designed and easy to answer. The feedback was very informative and interesting. The toolkits are engaging and informative. The Static Job Toolkit was very helpful and easy to follow. All in all the website was easy to navigate and understand and I found it very useful and helpful" (NHS Wales beneficiary, Cardiff and Vale University Health Board)*
- "Self-assessment is well worded, easy to follow. Feedback is clear and helpful. Spine fit for work exercises are great but would like a button there to download so that i can remind myself at work" (NHS Wales beneficiary, Aneurin Bevan University Health Board)

3.4.2 Employers

Back-on-LINE[™] impact and outcomes achieved with respect to attracting employers from different sectors was unprecedented and unexpected. From the original 2 NHS Wales Health Boards planned to deploy Back-on-LINE[™] we attracted the attention of all 9 NHS Health Boards and Trusts (including Velindre NHS Trust and Welsh Ambulance), 5 NHS England Trusts in South West England, Kent, Leeds, Bath and Birmingham; as well as Transport for London (TfL), Cardiff University. Our latest interested employer is the Rail Safety and Standards Board (RSSB) supporting Network Rail (Table 10). The Initiative was not long enough to deploy BACK-on-LINE[™] in all these organisations but we are actively working with these employers to launch our platform to all their staff.

Transport	Network Rail	40,268	8 859		^	x
	Transport for London LONDON	4,300	5 940		X	
	Royal United Hospitals NHS Trust, BIRM	1,052	231		X	
England	Revel Orthonoodia Hearital NHS Trust, RESION S M	2,500	221		X	
NHS	Community Health Care NHS Trust, LEEDS	3,000	660		X	
	Community Health NHS Foundation Trust, KENT	5,000	1,100		X	
HEI	Cardiff University, CARDIFF	6,600	1,452	Х		
	Velindre NHS Trust	670	147	X		
	Welsh Ambulance	3,500	770	Х		
	Powys Teaching Health Board	12,500	2,750	Х		
vvales	Betsi Cadwaladr UHB	16,772	3,690	Х		
CHVI Males	Hywel Dda UHB	10,000	2,200	X		
NLIC	Cwm Taf UHB	13,500	2,970	Х		
	Swansea Bay UHB	12,500	2,750	Х		
	Aneurin Bevan UHB	11,490	2,528	Х		1
	Cardiff and Vale UHB	14,500	3,190	Х		1
Sector	Employer	Employee	potential beneficiaries (22% PP)	Delivering	Engaged	Reached
			Number of BACK-on-LINE™			

Table 10.	Employers	delivering.	engaged.	reached b	v BACK-on-LINE [™]
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The unprecedented number of employers engaging with BACK-on-LINETM provides clear evidence of feasibility in its suitability and potential of impact within different work sectors, namely healthcare and transport.

Employers currently delivering BACK-on-LINE[™] reported a positive impact in their Occupational Health Services being able to offer a high quality online resource to their employees to pro-actively manage their back problem whilst in work. Feedback from Occupational health managers and practitioners to date is in Table 11.

Table 11. Employers' feedback to date

- *"Excellent and easy to understand" (Cwm Taff UHB Occupational Health Manager)*
- "An excellent tool for staff to use, easy to navigate and some very useful messages!" (CVUHB Occupational Health Physiotherapy Lead)
- *"Bright and very easy to navigate. I particularly like the exercise demonstration graphics" (ABUHB Occupational Health Manager)*

An additional feedback from number of employers was related to a possibility to access organisationspecific metrics regarding occupational LBP. This function already exists within BACK-on-LINE[™] via a Dashboard currently accessible to the Initiative Lead as per CU Research Governance code. The BACKon-LINE[™] dashboard however, can be accessed by anyone who obtains a secure log-in. This can be then used to access employer-specific and anonymous data on usage, health- and work-related outcomes over time. The anticipated outcome of this Initiative is to make the Dashboard an additional feature of BACK-on-LINE[™].

3.4.2.1 Outcomes relating to Healthcare Sector (NHS Wales and England)

NHS Wales had been involved from the outset through joint working with the Occupational Health (OH) Physiotherapy Lead and a Manager from the two largest Health Boards in Wales. Iterations of BACK-on-LINE[™] format, design and content had been revised by these individuals through a process of rapid prototyping involving sending iterations of BACK-on-LINE[™] for feedback and development of next version again sent for feedback.

The development phase also included conducting interviews and collecting data on BACK-on-LINE[™] acceptability from the NHS worker beneficiaries. Access to the beneficiaries had been challenging due to lengthy processes of NHS site access via our Biomechanics and Bioengineering Research Centre Versus Arthritis multi-project Ethical approval taking 3 months longer than anticipated.

Based on this learning, we submitted a separate Health Research Authority (HRA) and Health and Care Research Wales (HCRW) Ethics application for the BACK-on-LINE[™] feasibility study (final phase of this Initiative). Whilst this was a lengthy and onerous process, the unanticipated benefit was that the BACK-on-LINE[™] became accessible to all 9 NHS Wales Health Boards and Trusts expanding its reach from estimated 34,000 to 77,000 potential beneficiaries. The study was also adopted on the HCRW portfolio allowing us to further widen reach to NHS England. Subsequently, we had been contacted by 5 NHS England Trusts interested in in launching BACK-on-LINE[™].

The study set up and BACK-on-LINE[™] promotion had again been varied across different Trusts and Health Boards. This had been noted by the HCRW who asked us to use the BACK-on-LINE[™] study as a case study to identify the disparity in processes across the different NHS Wales Research and Development offices. This has helped eventually to speed up the process of set up.

Important learning point from using the NHS to develop and test online health technologies; whilst involving the NHS gives credibility, the process of obtaining the site access and a level of bureaucracy and variation between the different Trusts made the process extremely challenging and lengthy (6 months in this case) to complete, albeit worth doing.

3.4.2.2 Outcomes relating to Transport Sector (Transport for London, Network Rail)

Transport for London (TfL) contacted our team after we presented BACK-on-LINE[™] at a conference meeting. TfL Head for MSK health and wellbeing commented that unlike any other work related health and well-being health technology, BACK-on-LINE[™] stood out for the following reasons (i) **High credibility, evidenced by the level of transparency regarding the research process; (ii) partnership with the NHS and DWP financial support and; (iii) overall aim to use work environment as means of recovery, reassuring staff that in most cases LBP can be safely managed in work and providing bespoke physio guidance and exercises to do so.**

Our initial discussion progressed to a collaborative agreement between Cardiff University (CU) and Transport for London (TfL) to work jointly on a customisation of BACK-on-LINETM processed by CU Technology Transfer Team. This is to involve BACK-on-LINETM customisation of the 'Getting your spine fit for work' module for the Train drivers (particularly affected due to long sitting times in cramped conditions) and an addition of the aforementioned BACK-on-LINETM dashboard. Thus far, we had been approved to proceed by the DWP and now are in process of negotiating the cost of this work within a 9 month project (4 months for customisation and 5 months for test launch) at TfL.

Finally, we had been approached by Rail Safety and Standards Board (RSSB) providing service for Network Rail (40k employees) expressing an interest in BACK-on-LINE[™] for their rail workers. We plan to follow up on this potentially creating a platform suitable for both, Network Rail and TfL allowing us to split the cost of any customisation required.

Overall, the experience from delivering this initiate across different sectors was that employers are willing and ready to intergrade innovative health technologies as a resource to improve their workers' health and wellbeing. The NHS is inter-connected and offers a robust method of testing health technologies. However, the operationalisation is hindered by its bureaucratic and inconsistent

processes and level of acute risk aversion that can be prohibitive to innovation. Transport sector on the other hand, appears to be much more focussed on operationalisation of online resources to improve workforce health quickly, although perhaps lack the processes and ability to assess health technology suitability, relevance and its cost effectiveness to the employer.

4 Recommendations

4.1 Recommendations of scaling up and replication

This Initiative has considered scale up and replication from the outset with three key recommendations:

- (1) Higher Education Institutions (HEI) NHS partnership to develop and test health technologies brings significant benefits in terms of perceived product credibility and robust processes to follow, ensuring appropriate path is taken in terms of research governance, data management and ethics.
- (2) NHS is a very good development- and test-bed offering access to an 'expert' healthcare workers of varied skill mix, qualification level, access to technology and physical demands of the job. This help to develop technologies relevant to those in static sitting jobs as well as those in physically demanding jobs.
- (3) Level of implementation can be significantly higher by reducing the health technology complexity, set-up and maintenance costs. BACK-on-LINE[™] suitability for anyone with self-reported LBP, embedded eligibility and self-screen offered employers a resource with very little running costs. There is no requirement for staff to be involved in selection, screening, recruitment, data collection or analysis as all these tasks are performed automatically through the user interaction with the platform. This meant that we were able to launch BACK-on-LINE to all NHS Wales as not extra intervention cost.

4.1.1 Replication

Engaging and delivering BACK-on-LINE[™] in the NHS across Wales and England allowed us to obtain key learning on replication with the following recommendations:

- (1) NHS Research and Development inter-connectedness and established processes offer an important and robust platform that can be utilised during replication within the NHS. In this Initiative, submitting a separate ethics for the BACK-on-LINETM feasibility study meant the study was adopted by Health and Care Research Wales (HCRW) Portfolio and Central Portfolio Management System (CPMS) that essentially advertised BACK-on-LINETM and the study to every site in the NHS at no extra cost.
- (2) Following Medical Research Council (MRC) Guidelines on developing and evaluating complex interventions and Health Research Authority (HRA) research governance process is critical mediator of a successful scale up within the NHS. In this Initiative we began this process by completing the first 2 steps (i) BACK-on-LINETM development via method of co-production and (ii) BACK-on-LINETM feasibility, acceptability and potential health and work benefit testing in different Trusts and Health Boards in Wales and England. If successful, the next step to mediate replication will be an application for additional research funding to carry out a full randomised controlled trial (RCT) inviting all NHS Trust across the United Kingdom to participate.

4.1.2 Scale up

Our engagement with Transport for London allowed us to obtain key learning on scale up to other work sectors with the following recommendations:

(1) BACK-on-LINE[™] scale up to other work sectors will require level of customisation. Evidenced by this initiative, TfL customisation request included: a/ modification of balance and detail of guidance

offered specifically to train drivers with higher level of LBP prevalence b/change of outcomes of interest collected by BACK-on-LINETM c/ use BACK-on-LINETM as a form of e-resource for workers to access all other online resources currently offered by TfL to their workforce

(2) The level of customisation can be accurately costed and delivered by the existing Cardiff University Team. This Initiative offers an example quote based on our engagement with TfL (Table 12.).

Description	Mths	Cost (incl. CU indirect and infrastructure costs)
Phase 1: Work with Onclick to modify module 1 (introduction) and module 2 (spine fit) as per your feedback	2 staff (physio, software engineer) support for 2 months	£ 6,287
Phase 2: Modify eligibility and self-assessment pages (remove startback, self-efficacy and questions not essential for type 1 and 2 classification, add Orebro) add text to save pages into favourites to make it accessible for the future	2 staff (physio, software engineer) support for 2 months	£ 6,287
Phase 3: Support BOL launch (troubleshoot any network issues, user issues, problems with access or data travel) support and advise on marketing, drive social media, produce leaflets reports on usage, number of people accessing self-screen, eligible, and self-assessment results pre and post launch	2 staff (physio, software engineer) support for 5 months	£ 15,718
ARCCA secure Cardiff university webserver to hold and manage data for 24 months	Virtual Appliance based on Centos 7 - Virtual Machine Specification - 1 CPU, 2GB RAM, 40GB Storage (for the period 1 July 20 to 1 July 22)	£ 540.56
	Subtotal	£ 28,832
	VAT	£ 5,767
	Total	£ 34 598

Table 12. Example of Back-on-LINE[™] customisation quote

(3) Any potential health technology developer needs to consider that employers prefer to subcontract a service rather than deploy their own systems and resources to customise, run and manage health technologies. Again, this is evidenced by our engagement with the transport sector preferring to subcontract our group to make any required modifications of BACK-on-LINETM.

4.2 Recommendations for policy makers/funders

4.2.1 Recommendations

- (1) Encourage early engagement with policy makers to ensure any proposed health technology is in line with the current policy drive and attracts investment. Our Initiative has engaged early with the Welsh Government Major Health Conditions Policy Manager and In-work support Initiative representatives. This proved extremely useful, widening BACK-on-LINETM reach to key individuals able to promote BACK-on-LINETM within the NHS and beyond. Exposure of BACK-on-LINETM at the Welsh Health Summit has significantly accelerated the feasibility set up within the NHS Health Boards in Wales.
- (2) **Promote and facilitate partnership with Higher Education Institutions (HEIs).** HEI Industry (public/private) partnerships can work extremely well to deploy robust methods in accordance with the research governance, ethical principles and guidance already available and in place. We learnt that there is a huge appetite from the employers and their respective Occupational Health Services to deploy health technologies to empower and inform their workforce to improve health and wellbeing in work.

- (3) Encourage developers to deploy appropriate methods of technology development and evaluation. Working with employers and beneficiary representatives is critical to develop and/or customise existing health technologies effectively and bring the required benefit to each organisation.
- (4) Offer employers resources and support to be able to quickly evaluate, adopt and deliver new health technologies potentially relevant to their workforce. Currently, employers prefer to subcontract a service to develop, set-up and maintain rather than deploy their own resources to embed health technologies within their organisation. Some level of centralised support or a resource to enable employers to adopt new health technologies more efficiently may reduce cost and enhance usefulness.

4.2.2 Cost of delivering BACK-on-LINETM

Back-on-LINE[™] set up and delivery costs are £34,611.85 (excluding VAT) for the first 12 months, costs there-after amount to £7,487. From this Initiative learning the most effective cost model is to front-load the cost within the first 3 months to cover any modifications required with the remainder split evenly between remaining 9 months to cover platform management (trouble shooting issues with local network, internet service provider and access), data storage and management and providing analysis reports to the employer.

Staff cost

Physiotherapist (grade 6 £22.75/hr) for 2 day per week (month 1-3) to work with the employer, webdesigners to modify BOL and 1 day per week (month 4-12) to process and analyse BOL data and provide quarterly reports is £3,822 (month 1-3) + £5,733 (month 4-12) = total £9,555* (this cost may be managed internally by the employer deploying their own physio, skill dependent) **Costs thereafter for reporting and required updates 1 day/month/12 months (£1,911)

Web-designer (grade 6 £22.75/hr) for 2 day per week (month 1-3) to work with the employer, webdesigners to modify BOL and 2 days per month (month 4-12) to process and analyse BOL data and provide a report is £3,822 (month 1-3) + £2,866.50 (month 4-12) = total £6,688.50 **Costs thereafter for reporting and required updates 1 day/month/12 months (£1,911)

On-costs (standard university fee to cover infrastructure costs, estate costs)

Estate costs £1,624.35 ** Cost thereafter (£382.20/ year) Indirect costs £12,994 ** Cost thereafter (£3,057.60/ year)

Consumables

ARCCA secure web-server space for 12 months (\pm 450) ** costs there-after \pm 450 per year Onclick to apply any changes within the modules (\pm 3,300) **costs there-after minimal if any

4.3 Recommendations for organisations working with employers and beneficiaries

Based on our own Initiative, there are several recommendations we would like to offer to organisations working with employers and beneficiaries.

Ascertain the level of commitment and capacity of the individuals representing the employer. It

became evident n our initiative that Occupational Health service, whilst keen to adopt innovative practice, are time and capacity poor. This hindered the level of engagement at one of the two original NHS sites.

Identify processes of accessing beneficiaries and ensure there is appropriate contract in place before embarking on recruitment to develop and evaluate health technologies. Site access within our Initiative became an issue despite ethical approval in place for phase 1 due to change in process we were not aware of at the application stage.

Formulate a scale up and replication plan early to capitalise on any opportunities presented during the Initiative. We had a clear costing plan and contract in place soon after receiving DWP approval which allowed us to proceed quickly with TfL customisation currently under negotiations.

5 Limitations

BACK-on-LINE[™] had only recently began collecting data from the beneficiaries. This means that whilst we are confident about BACK-on-LINE[™] feasibility we may be limited in offering conclusive findings on BACK-on-LINE[™] health and work-related impact.

The proposed Initiative involved the first phase of complex intervention development and evaluation of BACK-on-LINE[™] feasibility of set up, reach and usage. Whilst this data is critical to inform further development, funding potential and required sample size of future research, the nature of the preand post-intervention single group study design, where there is no control group, only allows us to determine a potential for benefit, not the actual benefit or impact. Full randomised controlled trial is required to determine the full BACK-on-LINE[™] impact health and work-related outcomes.