

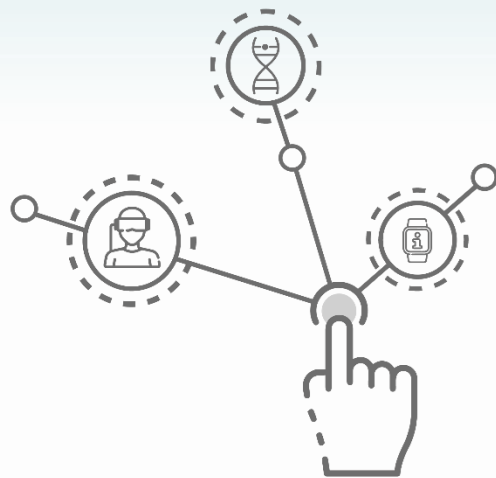


Delivering value with digital technologies
Briefing: May 2022



Using virtual reality to improve access to pulmonary rehabilitation

Case study



Supported by



Health Education England

Delivering value with digital technologies

Digital technologies such as digital medicine, genomics, artificial intelligence and robotics have a huge potential to transform the delivery of healthcare.¹

These technologies can empower patients to participate actively in their care, with a greater focus on wellbeing and prevention. They also support the prediction of individual disease risk and personalise the management of long-term conditions.

The HFMA, supported by Health Education England, is delivering a 12-month programme of work to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency.²

As part of the programme, the HFMA is publishing a series of case studies. Working with organisations who have started on the digital transformation journey, we will identify examples of good practice and highlight the challenges that services face. This will include specific challenges relating to NHS finance.

This case study describes how digital technologies can improve access to pulmonary rehabilitation as a treatment for chronic lung conditions. Virtual reality headsets enable patients to complete the treatment programme from their own homes at a time convenient for them. Early findings from pilot sites appear to indicate that this care model may improve access to treatment, increase productivity and address workforce capacity issues.

The CPD Standards Office

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¹ HFMA [Introduction to digital healthcare technologies](#), July 2021

² HFMA [Delivering value with digital technologies](#)

Introduction

Respiratory disease affects one in five people in England and is the third leading cause of death worldwide, after ischemic heart disease and stroke³. However, many people in England do not have access to one of the main forms of treatment – pulmonary rehabilitation – and for those that do the drop-out rate is high.

Chronic respiratory disease

The World Health Organisation defines chronic respiratory diseases as diseases of the airways and other structures of the lung. Some of the most common are chronic obstructive pulmonary disease (COPD), asthma, occupational lung diseases and pulmonary hypertension⁴.

Acute exacerbation⁵ for patients with COPD or other chronic respiratory diseases can lead to increased reliance on steroids and antibiotics and severe exacerbations can lead to hospital admission and increased risk of complications from comorbidities.

Treating chronic respiratory diseases

Chronic respiratory diseases are not curable, but various forms of treatment are available to patients. These treatments can help control symptoms, reduce incidence and severity of exacerbations, and increase the quality of life for people with the disease. The three most effective treatments are listed below and are most effective when used in combination:

- smoking cessation
- pulmonary rehabilitation
- inhaled maintenance therapy⁶

The *NHS long term plan*⁷ includes respiratory diseases as one of the NHS priority areas for care quality and outcomes improvement.

Pulmonary rehabilitation

Pulmonary rehabilitation is one of the main forms of treatment available to patients with chronic respiratory disease. It offers a structured exercise and education programme designed for those with lung disease or breathlessness.

Pulmonary rehabilitation courses

A pulmonary rehabilitation course typically lasts six to eight weeks, with two sessions of around two hours each week, and includes an individually prescribed exercise and education programme involving aerobic exercise, resistance training and lifestyle support.

Delivery of courses varies but a typical group will have six to ten people and classes may be held in local hospitals, community halls, leisure centres and health centres.

³ World Health Organisation, [The top 10 causes of death](#)

⁴ World Health Organisation, [Chronic respiratory diseases](#)

⁵ Acute exacerbation, sometimes referred to as a flare-up, is when chronic respiratory disease symptoms become particularly severe.

⁶ Inhalers enable drugs to be delivered directly to the airways for maximum benefit. Maintenance inhalers are used daily to help control chronic respiratory disease and prevent symptoms from occurring. Maintenance inhalers do not work to treat sudden symptoms or exacerbation.

⁷ NHS England, [NHS long term plan](#) paragraph 3.82–3.88, January 2019

The service is usually run by a community team made up of trained health care professionals such as physiotherapists, nurses and occupational therapists.

The National COPD Audit Programme in 2017 identified 195 separate pulmonary rehabilitation services, delivered by 158 different provider organisations in place across England⁸. Most services are provided by NHS trusts and health boards, but providers also included charities, community interest companies and private providers.

Benefits of pulmonary rehabilitation

Pulmonary rehabilitation aims to reduce shortness of breath (breathlessness), improve feelings of low energy, and increase ability to exercise and stay active. 90% of patients who complete a pulmonary rehabilitation programme experience improved exercise capacity or increased quality of life.⁸

Pulmonary rehabilitation has been shown to support better self-management and reduction in exacerbations, reduction in numbers of acute and emergency admissions and reduction in primary care appointments.⁸

The challenges

While the benefits of pulmonary rehabilitation are recognised, there are challenges in increasing access to treatment, and ensuring patients complete the course of treatment.

Capacity

Increasing access to pulmonary rehabilitation is noted as a key requirement towards achieving the aims of the *NHS long term plan*⁷.

In 2019, pulmonary rehabilitation was only offered to 13% of eligible COPD patients, focusing on patients with the most severe symptoms and risk of exacerbation. Building on the commitments in the *NHS long term plan*, NHS England and NHS Improvement published plans on their website to increase referral rates to pulmonary rehabilitation from 13% to 60% by 2023.⁸

From 2017 the GP Contract has included a *Quality outcomes framework*⁹ incentive to encourage referrals to pulmonary rehabilitation services. The 2022 contract sets a threshold of 40% to 90% of eligible¹⁰ patients to be offered a referral.

However, there are challenges in the level of expansion required to meet these targets that are unlikely to be able to be addressed by a simple extrapolation of current service provision:

- Given the existing workforce constraints across the NHS, where are staff to be recruited from to provide a four-fold increase in activity?
- The same applies to physical capacity. Where can the additional sessions be delivered?

Drop-out rates

There is a high drop-out rate amongst patients referred for pulmonary rehabilitation. One contributing factor in the drop-out rate is thought to be the waiting times between referral and being offered a place on the programme. Another factor is inconvenience due to location, frequency, time and duration of appointments especially among working age adults.

⁸ NHS England, [Pulmonary rehabilitation](#)

⁹ NHS Digital, [Quality and outcomes framework \(QOF\)](#)

¹⁰ Patients with COPD and Medical Research Council (MRC) dyspnoea scale ≥ 3 at any time in the preceding 12 months (excluding those who have previously attended a pulmonary rehabilitation programme).

Using digital technology to increase access to pulmonary rehabilitation

GP Dr Farhan Amin through his company Concept Health Technologies has developed a digital solution which aims to address these challenges, using virtual reality.

Virtual reality

Virtual reality (VR) is a technology that allows a user to simulate a situation or experience, using a VR headset, within an interactive computer-generated environment.

VR is starting to be used in medical training, for example when studying human anatomy or surgical procedures. The Royal College of Surgeons have accredited a VR platform which provides doctors with a 'flight simulator' for total hip replacement training. The platform provides visual aids, and also uses haptics¹¹ to simulate the feel of tissue, bone and muscle¹².

VR is also starting to be used as part of patient care. Oxford Health NHS Foundation Trust piloted an avatar-based virtual reality supported therapy to assist service users address common mental health issues. During therapeutic sessions, service users enter a secure, virtual landscape where they manipulate avatars and props to explore different perspectives, visualise futures and solve problems, helping to build resilience and support recovery. It was found to be particularly useful for engaging with children and young people who were reluctant to talk or who had autistic spectrum disorders.¹³

Examples are emerging of VR technology being used to help patients manage pain, reducing the need for opioid prescriptions. A study at the Cedars Sinai hospital in Los Angeles found that patients wearing VR goggles that immersed them in relaxing rides through Icelandic scenery or swimming with whales reported a 24% drop in their pain scores¹⁴.

The pulmonary rehabilitation digital solution is known as *PR-in-VR*. Patients are provided with kit consisting of a virtual reality headset, a wearable pulse oximeter¹⁵ and a mobile data hotspot (figure 1).

Figure 1: Kit provided to patients on remote pulmonary rehabilitation programmes



A bespoke education and exercise programme is loaded onto the virtual reality headset for each patient, who can then undertake a class at a time convenient for them in their own home. Trained professionals are available remotely at all times and are notified when a patient comes online, so

¹¹ Haptic technology creates an experience of touch by applying forces, vibrations or motions to the user.

¹² Digital Health, [VR surgical simulator first to receive Royal College accreditation](#), April 2019

¹³ FutureNHS Collaboration Platform, [Global Digital Exemplar Blueprints](#)

¹⁴ Cedars Sinai, [Virtual reality offers real pain relief](#), May 2017

¹⁵ A pulse oximeter is a small medical device that is put on the tip of the finger. It measures blood oxygen levels by transmitting light through a finger

patients have access to real-time supervision while exercising, although the majority of their interaction is with the software.

This [BBC news report \(https://youtu.be/ERV2G6i8EoI\)](https://youtu.be/ERV2G6i8EoI) shows a video of how the virtual reality headset works in practice in a pilot in Cumbria where Dr Amin works as a GP. Other organisations commissioned pilots in 2021/22 including North Lincolnshire Clinical Commissioning Group¹⁶ and Staffordshire Integrated Care System. Both these organisations have secured funding to continue the project for another 12 months.

Figure 2 shows a patient using the kit in their own home and an image of what they are seeing on the headset, which is aimed at providing a relaxing environment for them to exercise in.

Figure 2: A patient using the kit in their own home



Understanding the costs and potential benefits

This section describes the costs and potential benefits that have been identified during the pilot schemes.

Costs

Technology cost

The kit costs £415 which includes the required licence. It has an expected two-year lifespan, meaning that a single kit can be used to deliver up to 13 pulmonary rehabilitation programme cycles, resulting in a cost per patient of about £32.

For the commissioned pilots, the kit was purchased using funding from the NHSX elective recovery tech fund.¹⁷

Staff costs

As noted above a qualified staff member will be alerted when a patient joins online but interaction with the patient is minimal. This means that a single staff member can supervise multiple patients simultaneously, with referrals from across a whole primary care network or integrated care system.

For the pilots, services were run by two members of staff working 12 hour shifts on flexible working arrangements similar to a non-resident on-call.

¹⁶ [North Lincolnshire lung patients first in UK to benefit from NHS intelligent virtual rehab service - NHS North Lincolnshire CCG](#)

¹⁷ NHS transformation directorate, [Elective recovery tech fund](#) – a £250 million fund in 2020/21 supporting up to 400 projects aimed at accelerating the uptake of digitally supported care in planned, or 'elective', care pathways

Benefits

PR-in-VR was developed by Dr Amin to address two problems:

- How to improve access to pulmonary rehabilitation for eligible patients?
- How to reduce the drop-out rate of those patients who have started a pulmonary rehabilitation course?

The pilots have identified how *PR-in-VR* may address these two problems along with providing a potential solution for improving overall productivity.

Improving access to pulmonary rehabilitation for eligible patients

By increasing capacity there should be a higher rate of conversion from referral to attendance and a reduction in waiting times.

The supervision model can help to address workforce constraints, enabling flexible and remote working. Staff who are unable or unwilling to deliver face-to-face care may welcome an alternative employment opportunity which continues to utilise their skills and experience.

Pulmonary rehabilitation capacity can be increased without the need for additional physical space. In theory, this could increase capacity sufficiently to respond to all referrals without waiting lists, but availability of staff and kit may become the constraining factors.

Reducing the drop-out rate of those patients who have started a pulmonary rehabilitation course

Patients benefit from the convenience of exercising at their own convenience. This can result in not needing to take time off work, miss social events or arrange carers to look after dependants.

With face-to-face classes, the overall programme is a fixed length and if a patient misses any sessions they cannot repeat or make up the time. With *PR-in-VR* patients can request an extension to the programme so that they have the opportunity to complete the course.

Pilot schemes saw 80% of patients completing the course with excellent patient feedback.

Improving productivity

The main focus of *PR-in-VR* is to provide a means of extending access to pulmonary rehabilitation, improving health outcomes for patients with chronic respiratory disease. The pilots however also highlight a potential improvement in the overall productivity of pulmonary rehabilitation services with the virtual model extending access at a lower cost than additional face-to-face capacity:

- One qualified staff member is able to supervise more patients in a single shift than they would be able to in face-to-face sessions.
- Face-to-face sessions may have a team of staff present, including reception/administration.
- Rental charges associated with use of community-based facilities are avoided.
- Purchase of kit can be phased to match the rate of referrals and programme take-up. This will be a significant benefit if the virtual model is rolled-out more widely, as numbers will increase gradually even when additional capacity is introduced.
- Environmental benefits arise with neither staff nor patients travelling to sessions. This creates a small cash-releasing benefit to both patients and healthcare providers as transport costs are avoided.

Building a business case

Introduction of a model such as *PR-in-VR* in a primary care network or integrated care system would need a business case setting out a compelling case for investment. As pulmonary rehabilitation is an expanding service the business case would need to make the case for additional rather than replacement services and is likely to therefore compare cost of face-to-face capacity with alternative models. Expected expansion requirements would need to take into account local factors including population demographic, prevalence of chronic respiratory disease and the expected increase in referrals.

Conclusion

This case study provides an example of how innovative digital technologies provide the NHS with the opportunity to reimagine how care is delivered to patients with long term conditions. Initial findings from the pilots appear to indicate that by redesigning the patient pathway for patients with chronic respiratory diseases, there is the opportunity to provide pulmonary rehabilitation to a greater number of patients at lower cost.

How to find out more

If you want to find out more, contact:

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This case study is part of the *Delivering value with digital technologies* programme that the HFMA is undertaking, supported by Health Education England. The programme aims to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency. For more information click [here](#).

About Health Education England

Health Education England (HEE) is part of the NHS, and we work with partners to plan, recruit, educate and train the health workforce. HEE exists for one reason only: to support the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values and behaviours, at the right time and in the right place.

HEE's Digital Readiness Programme, commissioned by NHS England and NHS Improvement (formerly NHSX), aims to uplift digital skills, knowledge, understanding and awareness for all our health and care workforce. This includes:

- Supporting the right culture and environment, for example by ensuring digital is understood, embedded and championed at trust and ICS board level.
- Professionalising the digital workforce through support for professional bodies, regional Informatics Skills Development Networks, and collaborative community networks.
- Establishing learning and development through the NHS Digital Academy and specific learning and development initiatives, for example the Florence Nightingale Digital Nurse Scholarship, and through access to tailored, appropriate online learning for all.
- Building our future digital workforce by undertaking workforce analysis and demand forecasting, and sustainable models to recruit talent, for example through graduate schemes, as well as opportunities for nurturing existing talent, for example through the Topol Digital Health Fellowships.

For more information visit the [Digital Readiness Programme website](#) or follow the programme on Twitter [@HEE_DigiReady](#).

About the HFMA

The Healthcare Financial Management Association (HFMA) is the professional body for finance staff in healthcare. For over 70 years, it has provided independent and objective advice to its members and the wider healthcare community. It is a charitable organisation that promotes best practice and innovation in financial management and governance across the UK health economy through its local and national networks.

The association also analyses and responds to national policy and aims to exert influence in shaping the wider healthcare agenda. It has particular interest in promoting the highest professional standards in financial management and governance and is keen to work with other organisations to promote approaches that really are 'fit for purpose' and effective.

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