Technoleg Iechyd Cymru
Health Technology Wales

HEALTH TECHNOLOGY WALES (HTW) GUIDANCE 017-2 (October 2022)

Virtual reality interventions for the management of pain associated with medical procedures (update)

HTW Guidance:

The evidence partially supports the adoption of virtual reality interventions for the management of pain and anxiety in adults and children undergoing medical procedures, but the evidence is insufficient to support routine adoption.

The use of VR reduces pain and anxiety associated with a range of medical procedures as compared with standard care and is well tolerated.

While there is the potential for cost savings through a reduction in the use of analgesics, sedation or anaesthesia, the evidence to support this is currently limited. HTW would encourage the gathering of further evidence to define the economic and clinical impact of virtual reality in more detail.

Why did Health Technology Wales (HTW) appraise this topic?

The management of pain during medical procedures is critical to optimising patient experience. Common medical procedures that require pain management include wound care, dressing changes, physical therapy for burns, dental treatment, chemotherapy, intravenous (IV) access, and childbirth. Pharmacological approaches are often used to minimise procedural pain, but these can have significant drawbacks, including imprecise titration, narrow therapeutic windows, adverse side effects, high costs and potential for drug misuse.

Distraction therapy using virtual reality (VR) interventions may provide an alternative approach for managing procedural pain. VR immerses people within an artificial 3-dimensional (3D) environment through sensory stimuli, that include visual, auditory, and often touch sensations. This immersion, sometimes coupled with the possibility of active exploration of virtual environments, might facilitate a shift of attention away from any pain experienced.

The status of HTW guidance is that NHS Wales should adopt this guidance or justify why it has not been followed. HTW will evaluate the impact of its guidance.

Evidence Summary

Refer to Evidence Appraisal Report 017-2 (EAR017-2) for a full report of the evidence supporting this Guidance.

The evidence appraisal report aimed to identify and summarise evidence that addresses the following research question: What is the clinical and cost effectiveness of VR as a distraction therapy for the management of procedural pain?

The literature search identified three recent systematic reviews with meta-analyses and a further 17 randomised controlled trials (RCTs). The studies covered a wide range of medical procedures, including dressing changes for burns, needle related procedures, dental treatments and childbirth.

Two meta-analyses were carried out using standardised mean differences in pain intensity in adults undergoing a variety of medical procedures. One meta-analysis focused on average pain scores while the other focused on worst pain scores. In both analyses, pain scores were found to be lower when using VR. For studies involving children, we identified three systematic reviews and meta-analyses. The findings were consistent with the evidence in adults with most studies reporting that VR reduced pain in comparison to standard care. For both adults and children, VR systems also appear to be effective at reducing anxiety levels. Three RCTs found a statistically significant reduction in the mean anxiety score experienced by adults undergoing medical procedures. A further RCT found a lower anxiety score when VR was used but the outcome was not statistically significant. Two systematic reviews reported anxiety scores in children, one of which showed a reduction in anxiety when using VR while the other concluded that the studies were too heterogeneous to be pooled.

Four RCTs reported minor adverse events, including nausea and dizziness associated with VR among adults. One RCT reported no difference in dizziness or motion sickness between study groups and no serious adverse events during subcutaneous port access in children and adolescents. Studies reported a variable impact on patient satisfaction. In adults, two RCTs favoured the VR group while one RCT favoured the control group. However, the findings for this outcome were not statistically significant. In children, an RCT reported statistically significantly higher satisfaction scores when with VR, although further two studies reported no statistically significant differences in patient satisfaction. In RCTs involving adults, no studies found a statistically significant difference in procedure times. Among children, one study found a statistically significant reduction in average procedure time found to be 8.78 minutes shorter when VR was used during short-term dental procedures. We did not identify any outcome data relating to quality-of-life outcomes or procedure success rates.

No economic evidence was identified on the use of VR distraction therapy in people at risk of pain during medical procedures. The cost of commercially available VR systems varies depending on the functionality and sophistication of the system. Experts suggest that the Meta Quest and Pico devices are the most commonly used systems in the NHS, and these range from £318 to £660 each. In addition to commercially available VR systems, there are bespoke VR packages available, which have been specifically designed for use in healthcare. The Rescape DR.VR system is one such package and is available for a lease cost of £3,650 per year. There is the potential for the cost of using VR systems to be offset by savings in healthcare resource use, such as a reduction in the use of analgesics, anaesthesia, and associated recovery time. Two illustrative analyses were undertaken to demonstrate potential cost savings and it was found that the VR system could result in net cost savings if the VR device is used with sufficient frequency.

The appropriate mechanism for patient engagement was determined and the patient perspective was considered where possible. A literature search was also undertaken to report the

experiences, views and opinions of patients and families who have used VR headsets across multiple healthcare settings to manage procedural pain.

Appraisal Panel considerations

- The Appraisal Panel heard from clinical experts that patient experiences when using VR devices in practice are generally positive with little or no adverse events reported. This aligns well with the published literature that focused on the views and experiences of patients using VR during medical procedures. The Appraisal Panel noted that the evidence suggests that, in addition to reducing pain, anxiety and discomfort, the use of VR devices increases positive emotions, encourages treatment engagement, empowers, and motivate patients and improves relationships with healthcare professionals and healthcare settings.

- The Appraisal Panel considered the wide range of potential indications for VR distraction therapy and the way in which this is reflected in the heterogeneous evidence base. Clinical experts agreed that this is a key consideration when considering the effectiveness of VR as distraction therapy, which inevitably is dependent upon the specific patient group and procedure being undertaken. One expert gave the example of a patient who, due to phobia, would not have been able to receive chemotherapy without the aid of a VR device to distract them while treatment was being administered.

- The Appraisal Panel discussed the extent to which the older devices and studies included in the evidence appraisal report were still applicable to current day practice. Experts suggested that older editions of VR devices are still functional and could be advantageous although they may be more difficult to set up on initial use. Despite being less immersive, cheaper VR options such as those using cardboard headsets may also be beneficial since they are cheaper and can be used as single-use devices and therefore avoid some of the concerns around potential infection. Experts advised that, while newer VR devices are more immersive, realistic, comfortable to wear and easier to set up, the evidence using older devices is broadly transferable and applicable since the core concepts behind their use remain the same.

- Clinical experts highlighted the importance of patient preference when deciding whether to use VR. While many patients welcome VR distraction, it was reported that some patients prefer to know what is happening during a medical procedure, and that distraction therapy may add to distress. Furthermore, while fully immersive VR devices may be advantageous and more likely to distract for some patients, they may also pose disadvantages for others who may feel vulnerable and left alone in a 'virtual space'. The experts also explained that there is an additional risk that patients may be frightened if interrupted suddenly from an immersive experience. Experts also highlighted the importance of tailoring VR experiences to optimise effectiveness for each individual patient. The Appraisal Panel concluded that considerations about patient preference and informed consent are essential to offering and selecting VR as a means of achieving pain control.

- The Appraisal Panel noted that it is sometimes suggested that older adults may be less receptive to using VR devices due to less familiarity with such devices during their day-to-day living. The clinical experts, however, reported that their experiences in using VR in older patients has been generally positive and that older patients were more receptive to using VR devices than they had anticipated.

- The Appraisal Panel were told by the experts that, when setting up the VR system, it is important to consider the context in which it will be used. Procedures requiring someone to lie down might cause discomfort since VR devices are not designed to be used in this way. On the other hand, it was noted that VR systems can work well even when patients are wearing

oxygen masks. Experts also highlighted the importance of tailoring VR experiences to optimise effectiveness for each individual. For example, ensuring that any images that may trigger a phobia are avoided.

- The Appraisal Panel questioned the clinical experts about the importance of infection control measures. They were told that some VR systems have measures for infection control, consisting primarily of disinfectant wipes for cleaning the equipment after use. However, while the plastic parts of the VR systems can be easily wiped, other parts of the devices, such as the foam and straps are more difficult to adequately clean. Experts agreed that the risks associated with contamination and cross-infection depends on the patient population and the medical procedure. In most patient groups this risk is low, but it can be a greater concern in higher risk populations. A clinical expert working with adults with cystic fibrosis noted that infection control is critically important due to the immunocompromised status of the patients.

- The Appraisal Panel considered the practical implications of introducing VR and the clinical experts noted that there is additional staff time needed to correctly set-up the VR device, explain the process to patients and clean the headset and any other equipment after use. It was suggested, however, that the time commitment is greatest when using the VR device for the first time with diminishing staff time required as familiarity increases.

- The Appraisal Panel concluded from the published evidence that the use of VR, in a range of medical procedures, consistently reduces pain and anxiety as compared with standard care and is well tolerated by patients.

- The Appraisal Panel noted that there is very limited evidence available on which to base conclusions about the cost effectiveness of VR in reducing procedural pain. They noted from the expert opinions expressed and from the examples that had been prepared and presented by the HTW team that there is the potential for cost savings through the use of VR by reducing the need for analgesics, sedation and anesthetics. However, this has not been adequately researched in prospective and comparative studies. The Appraisal Panel recommend that such studies be undertaken to define the cost implications of the use of VR in real world clinical practice.

- The Appraisal Panel concluded that while there is evidence of clinical effectiveness to support adoption, the economic evidence is currently inadequate to do so. Further research is needed to define the cost implications of the use of VR and to further refine an understanding of the patients and circumstances in which benefit is likely to be greatest.

Responsibilities for consideration of this Guidance

Health Technology Wales (HTW) was established by Ministerial recommendation[1,2] to support a strategic, national approach to the identification, appraisal and adoption of non-medicine health technologies into health and care settings. The HTW Appraisal Panel comprises senior representation from all Welsh boards with delegated authority to produce guidance 'from NHS Wales, for NHS Wales'. The status of HTW guidance is 'adopt or justify'. There is an expectation from Welsh Government that HTW guidance is implemented with adoption regularly audited by HTW.[3]

The guidance in this document is intended to assist Welsh care system decision makers to make evidence-informed decisions when determining the place of health technologies and thereby improve the quality-of-care services.

The content of this HTW guidance was based upon the evidence and factors available at the time of publication. An international evidence base was reviewed and external topic experts and HTW committee members consulted to contextualise available evidence to Wales. Readers are asked to consider the generalisability of the evidence reviewed to NHS Wales and that new trials and technologies may have emerged since first publication and the evidence presented may no longer be current. It is acknowledged that evidence constitutes only one of the sources needed for decision making and planning.

This guidance does not override the individual responsibility of health professionals to make decisions in the exercise of their clinical judgment in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

No part of this guidance may be used without the whole of the guidance being quoted in full. This guidance represents the view of HTW at the date noted. HTW guidance is not routinely updated. It may, however, be considered for review if requested by stakeholders, based upon the availability of new published evidence which is likely to materially change the guidance given.

Standard operating procedures outlining HTW's evidence review methods and framework for producing its guidance are available from the HTW website.

Acknowledgements. HTW would like to thank the individuals and organisations who provided comments on the draft Evidence Appraisal Report or HTW guidance.

Declarations of interest were sought from all reviewers. All contributions from reviewers were considered by HTW's Assessment Group. However, reviewers had no role in authorship or editorial control and the views expressed are those of Health Technology Wales.

Chair, Health Technology Wales Appraisal Panel

1. National Assembly for Wales, Health and Social Care Committee. Access to medical technologies in Wales. December 2014.
2. Response to Recommendations from the Health & Social Care Committee: Inquiry into Access to Medical Technologies in Wales. February 2015.
3. Gething, V. Letter to all Health Board Chairs re Funding for Sacral Nerve Stimulation in Wales. VG_01655_17. September 2017.