



The use of VR in the preparation of children in the MRI setting

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Background

The loud, oppressive and intimidating environment of an MRI scan can make it a daunting experience, especially for younger patients^{1,2}. Motion during a scan due to discomfort or distress, can have a detrimental effect on image quality. It is often common practice to administer a General Anaesthetic (GA) to prevent motion, negating the need for repeat scans^{2,3}. However, the risks associated with GA are considerable⁴ and as such, several techniques have been trialled to reduce the need for anaesthetic. Previous studies have found that coaching patients prior to their scan, can assist in acclimatising patients to the MRI environment³. This has been found to increase first scan success and reduce the need for anaesthetic use by 46%^{5/6}.

Access to the app beforehand is essential. It helps with nerves/build up of anxiety

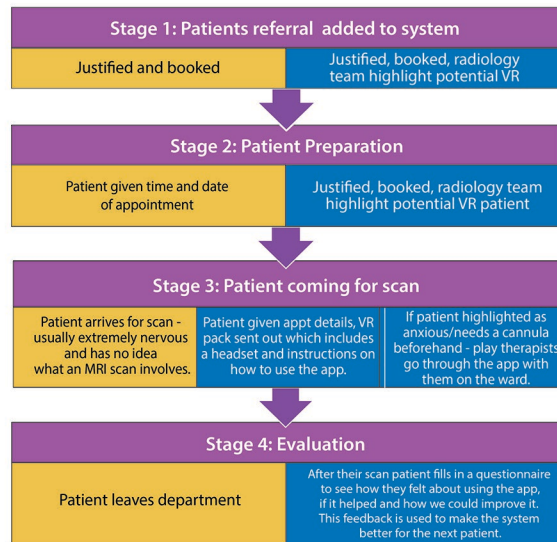
The current standard of care uses a picture book or mock scanner, however we have utilised the recent development of Virtual Reality (VR) technology to advance the technique of pre scan acclimatisation. By creating a VR application (app), we have found an engaging, low-cost, easily portable method of preparing younger patients for their scan in their own home. The only equipment required is a standard smart phone, a cardboard 3D viewer and a user friendly, free to download app. Pre-trial work was undertaken to test the suitability of the app for paediatric patients prior to commencing a formal trial. The aim of this research is to provide a comparison between those who use the app versus those who are prepared with the current standard of care. Here we present our pre-trial findings.

Method

It has been demonstrated that anxiety in patients begins when they are notified of their appointment for an MRI scan⁷. It is at this stage we have engaged with our patients. We have proactively identified children due to attend for an MRI scan and provided them with the resources to use the app. By adopting this approach, we sought to remove fear of the MRI scanner by allowing children to experience the app in their own home. Balen et al (2006)⁸ state that children need to be considered as 'active beings' in their own medical care, making their experience less traumatic.

The treatment was exceptional and my daughter managed the whole MRI. The goggles really helped.

This table compares the standard practice of MRI referral (left hand column) to our updated practice using the VR app resource (right hand column).



The app showed me that the machine didn't seem dangerous - this was a big fear for me.

Results

The table below highlights the average results from evaluating the app on 30 patients obtained from the post scan questionnaire. Patients were asked to rate various aspects of the app on a scale of 1-10 or if they would recommend it to others.

Criteria	
4-12 years old	
First MRI head awake	
Question	Results
Fun	8/10
Ease of use	8/10
Felt prepared	8/10
Recommend to others	100%

The goggles are cool, I can show friends so they understand what's going on and we can help each other with the experience

This has been the guiding principal in the development of this technique with the central goals of reducing the need for rescans and the use of GA.

Conclusion and Future Developments

Our development of the VR app has sought to make the process of MRI scanning people centred, safe and effective. These are the central principals laid out in the The Healthcare Quality Strategy for Scotland 2017/2018.⁹ NHS Highland covers a vast and remote area, our app allows us to reach members of the public who may not have the opportunity to have a familiarisation visit to the hospital. It has removed the unknown element of the scanning process and allows us to build a rapport with patients at an early stage. In terms of safety, 100% of our patients who have used the app have not required rescans or a GA. There has been a visible reduction in stress and anxiety in app users who have presented at the department. The reduction of rescans or reappointment for GA has also increased the efficiency within the department. One key points of note were that parents found the app to be of benefit to them in helping them and their child understand the MRI process.

We can conclude that the use of VR is beneficial, safe and is effective in preparing patients for their MRI scan. Our future trial will include an updated app specifically tailored for different age groups making it specific to their needs, with improved scalability to other sites. We will formally evaluate the effectiveness in reducing the need for GA in MRI as compared to the current standard of care.



A patient with the headset in MRI



"As a parent I thought it was fantastic, it helped me understand what my son would go through"

"I've already recommended it to someone"

The VR app takes you through a journey in MRI



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