Virtual Reality: Can it improve blood transfusion education?

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Background

- The Transfusion 2024 strategy, the most recent UK Transfusion Laboratory Collaborative Survey and Serious Hazards of Transfusion reports, have all emphasized the need for enhanced scientific training in transfusion[1-3].
- Recommendations included creating interactive tools and resources to enhance self-directed learning[2].
- Virtual Reality (VR) has proven effective in medical and nursing training; studies have shown its effectiveness in developing specialist skills and acquiring knowledge[4].
- VR allows for independent, practical training, which does not rely on consumables and patient samples, and importantly, allows users to fail safely, with no risk of patient harm.

Photograph by Caters Photographic for NHSBT, 2024

Aim

- Develop a VR package that allows the user to perform ABO/D grouping, in a realistic laboratory setting, and highlights the consequences of transfusing an incorrect blood group.
- Assess the potential of VR as a training tool in transfusion.
- Identify the strengths and limitations of this approach to guide future VR package development.

The NHSBT Blood Identification App

- Tile grouping was chosen for its effectiveness in showing red cell agglutination and ease of result interpretation.
- A voice over guides the user through the entire process.
- The patient focus throughout emphasizes the critical link between correct blood group identification and patient safety.

Key steps in the training package:

- Introduction to patient [1]
- Select group reagents from fridge and check expiry dates
- Dispense reagents onto tile [2] and mix carefully [3]
- Interpret the ABO/D group
- Select a suitable unit from blood bank fridge [4]
- Watch transfusion commence [5]
- Outcome of transfusion; incorrect unit selection triggers intravascular haemolysis video sequence [6]

Initial Evaluation

The VR package has been widely used at outreach events, conferences, and in training courses.

A survey was completed by 21 users (Table 1), who provided feedback on their VR training experience. Feedback was analysed thematically (Fig. 1) and average ratings for effectiveness (Fig. 2) and ease of use (Fig. 3) calculated. Their descriptions of the VR package are displayed as a word cloud (Fig. 4).

Table 1: Respondent Demographics

Scientist in Transfusion Laboratory	9
Other clinical or scientific role in Transfusion	3
School or college student	7
Laboratory support or non-scientific role	2

Fig. 1: A thematic analysis of feedback on the VR Blood Identification App

Immersive experience
Interactivity; hands-on
Realism; attention to detail
Patient focus; impactful
Ease of use; simplicity, clarity
Sensory engagement; haptic feedback

Task relevance; tile grouping not a routine laboratory test
Initial setup; fitting headset
Difficulty with some actions; opening fridge, pipetting pressure
Adjustment period; to being in VR environment

Fig. 2: How would you rate the effectiveness of the VR training in achieving the learning objectives? n=21

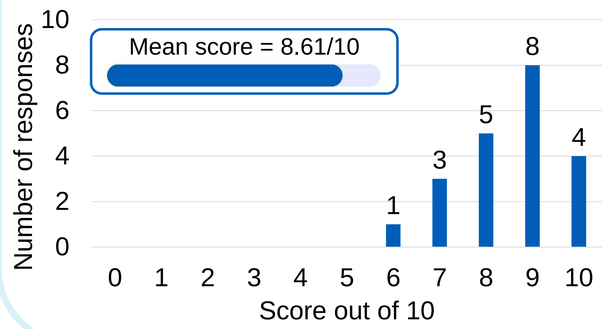

Fig. 3: How easy did you find the VR training to follow and work through? n=21

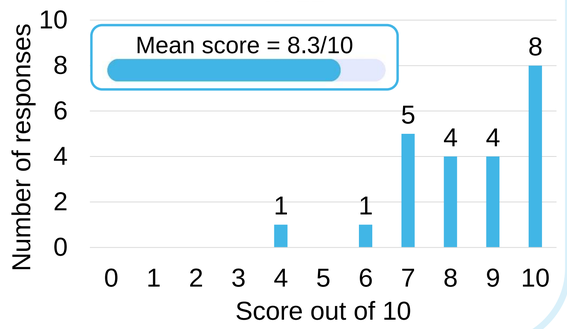

Fig. 4: Word cloud of respondents' descriptions of the Blood Identification package

Conclusion

- The Blood Identification package is highly valued for its realism and interactivity but faces some challenges with technical issues.
- Respondents from all demographics showed enthusiasm for VR and found the experience positive.
- This package will continue to be a valuable patient-focused introduction to transfusion, while future packages for Biomedical Scientists will focus on providing background knowledge, context and exposure to current techniques

Next steps

The long-term vision is to innovate transfusion training with a suite of VR packages, hosted in a virtual transfusion laboratory, to allow opportunity for self-directed learning and group teaching sessions.

References

1. Transfusion 2024 | National Blood Transfusion Committee (2020). Available at: http://www.nationalbloodtransfusion.co.uk/transfusion-2024 [Accessed: 19 August 2024]
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