

Digitising the Visual Reinforcement Audiometry (VRA) Ticksheet

Mark Chung¹, Nasreen Alam¹ and Selina Chan²

1. Auditory Implant Department, Royal National ENT & Eastman Dental Hospitals, University College London Hospitals NHS Foundation Trust

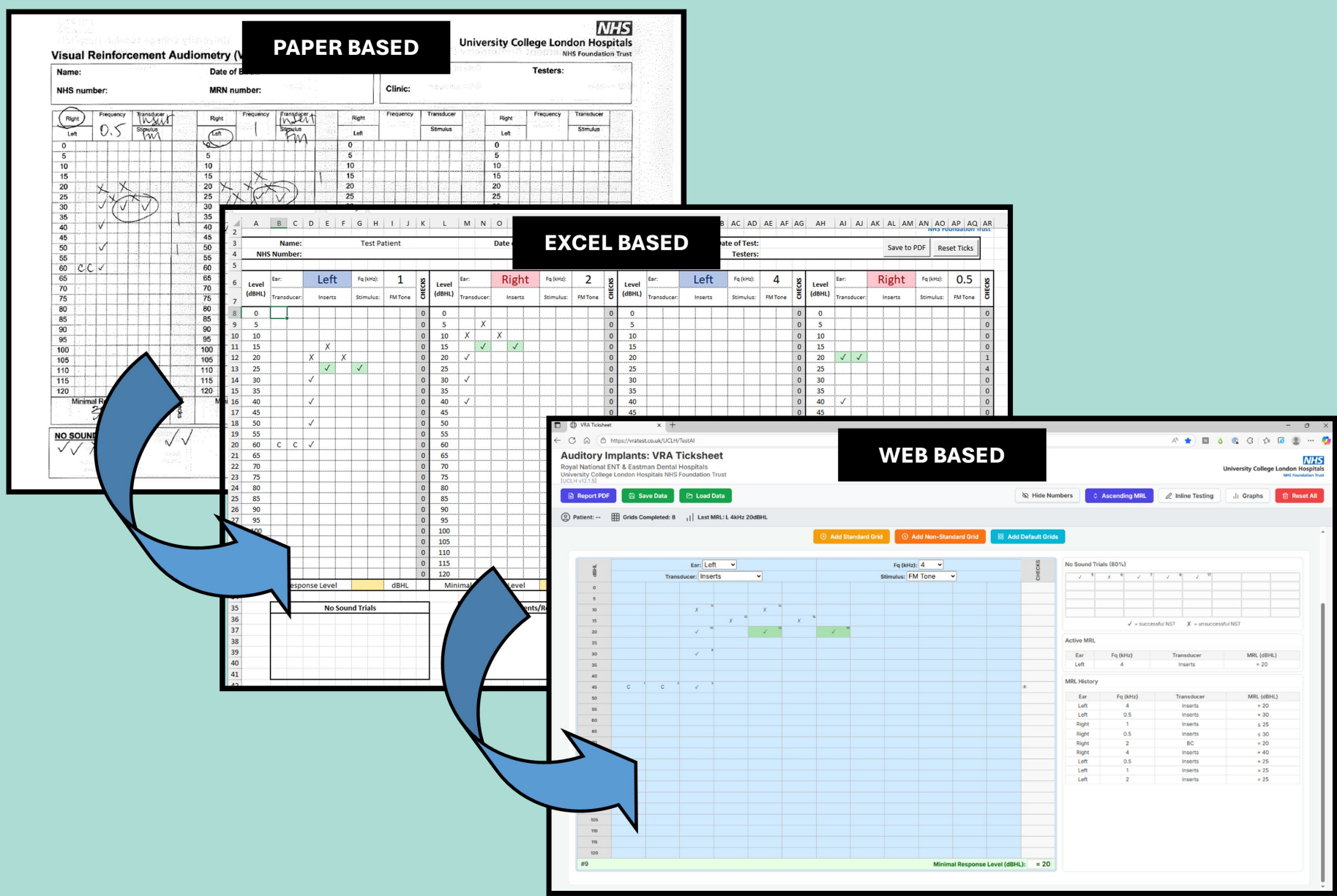
2. Paediatric Audiology Department, Royal National ENT & Eastman Dental Hospitals, University College London Hospitals NHS Foundation Trust

Introduction

Visual Reinforcement Audiometry (VRA) is a key paediatric test used to assess hearing behaviourally in young children by conditioning their response to auditory stimuli with visual rewards. Traditionally, audiologists rely on paper-based ticksheets to track responses during VRA testing. In keeping with NHS wide initiatives for sustainability, we focused on digitising the VRA ticksheet to reduce paper consumption. This would capture rich, auditable details about the testing process itself, such as patient reliability and conditioning which are not reflected in the final PTA results.

Method

Initially, attempts were made to recreate to paper based ticksheet into an excel based sheet, however, the need to run macros made this difficult to use throughout the trust. We then used available coding tools via ChatGPT and Google Gemini to develop a web-based ticksheet.



We worked with different departments' local peer review requirements to develop additional features which go beyond the paper based ticksheet, including:

- Automatic MRL detection logic
- Automatic calculation of percentage of correct no sound trials to help gauge reliability
- Graphing and numbering of responses allowing the presentation method employed to be shown and audited
- Graphing of patient responses to show when checking and no sound trials occurred, allowing the clinician to demonstrate that the stimulus presentation occurred when the patient was in a testable state
- Ability to record non-standard stimuli (e.g. music)
- Recording of results via a remote page on your phone

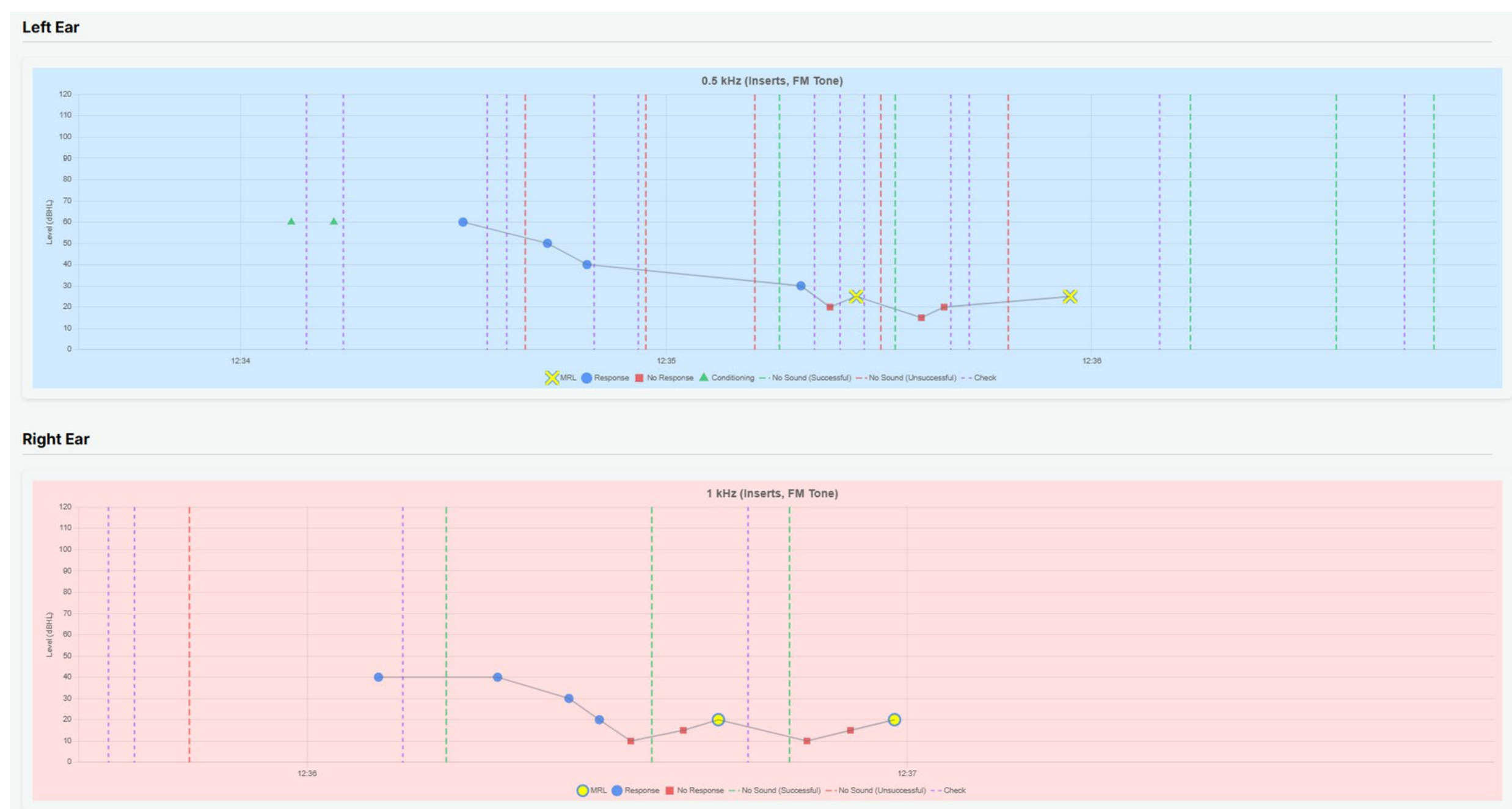
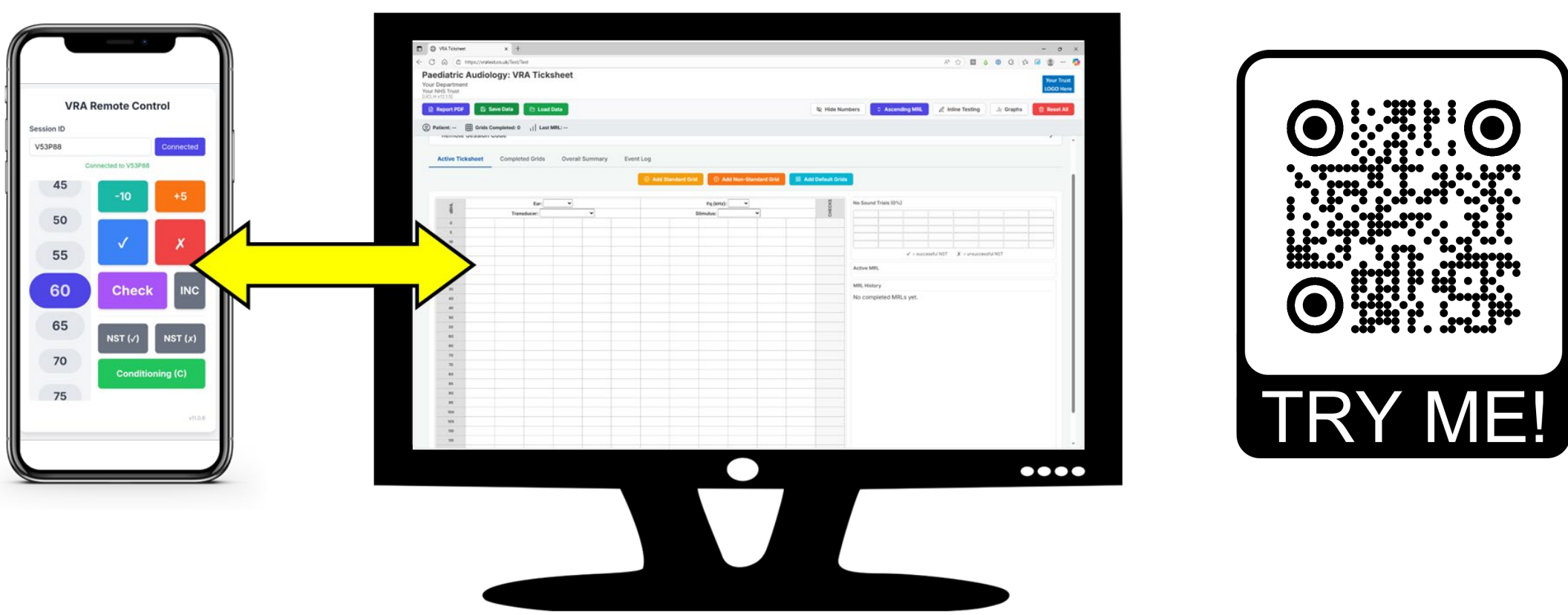


Figure 1.
Left Ear: Graph of presentations showing testing during unreliable patient state,
Right Ear: Graph of presentations showing a more reliable patient state



References

1. <https://www.england.nhs.uk/long-read/transformation-and-innovation-delivery-update/>,

Results

Feedback from various trusts that helped trial the website were incorporated into the design of the final digital ticksheet and included:

- QR Code linking of a remote app with the webpage
- Ability to pre-populate default grids for testing
- Changes to minimum response level logic
- Recording options for patient checks and no-sound trials
- Keyboard shortcuts to speed up entering and toggling between different grids

Feedback was then obtained via an online survey from users across the different trusts as to how they felt the digital ticksheet compared to the paper ticksheet in a range of categories, including audit, time to fill in and ease of use. 10 responses were received. The digital ticksheet was found to be better in all domains, although there were some clinicians who strongly felt the paper version had its benefits, and it is recognised that the digital version will not always be appropriate and requires practice to improve ease of use and time to complete.

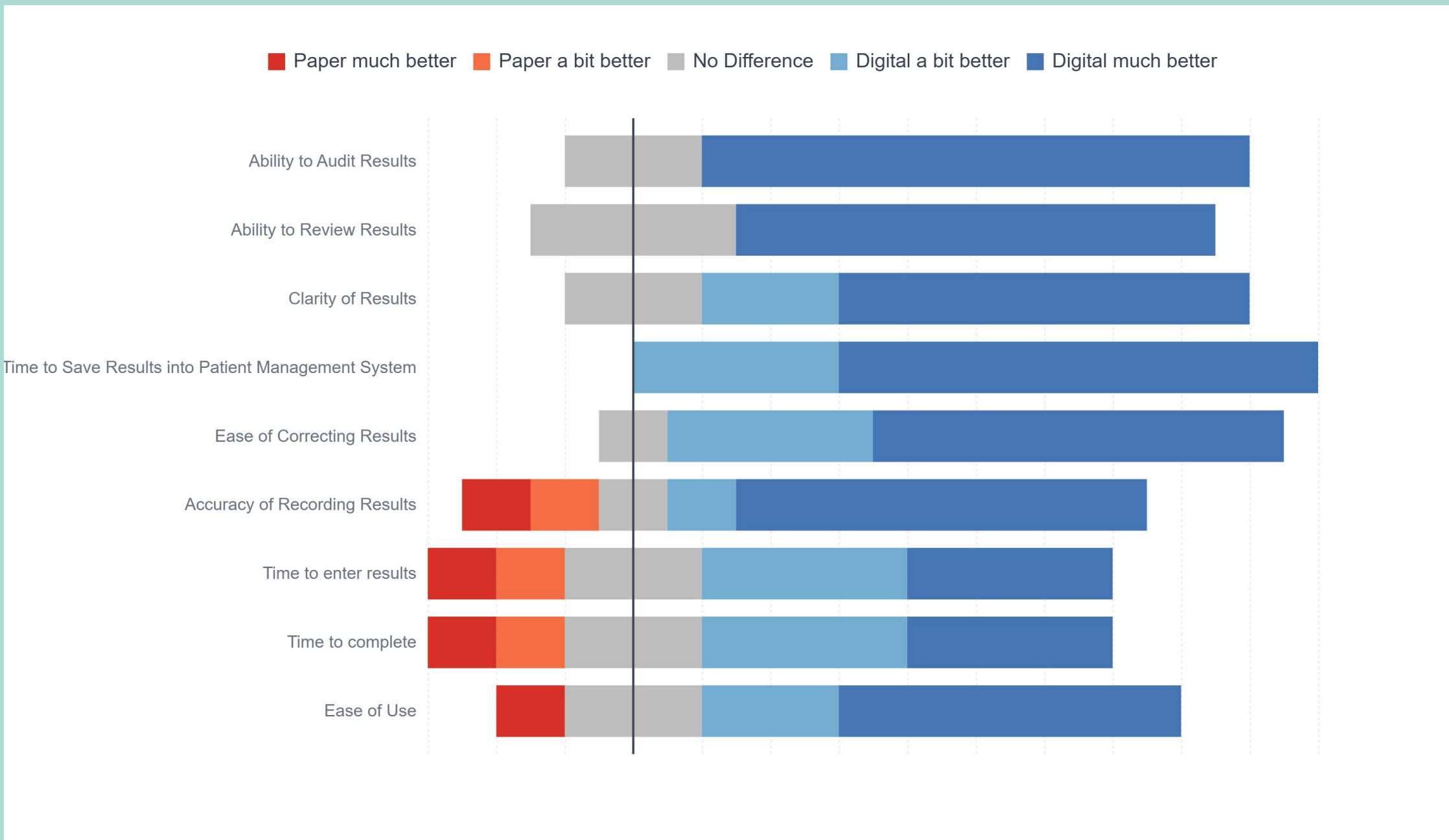


Figure 2. Graph of results from feedback survey on use of paper versus digital ticksheet

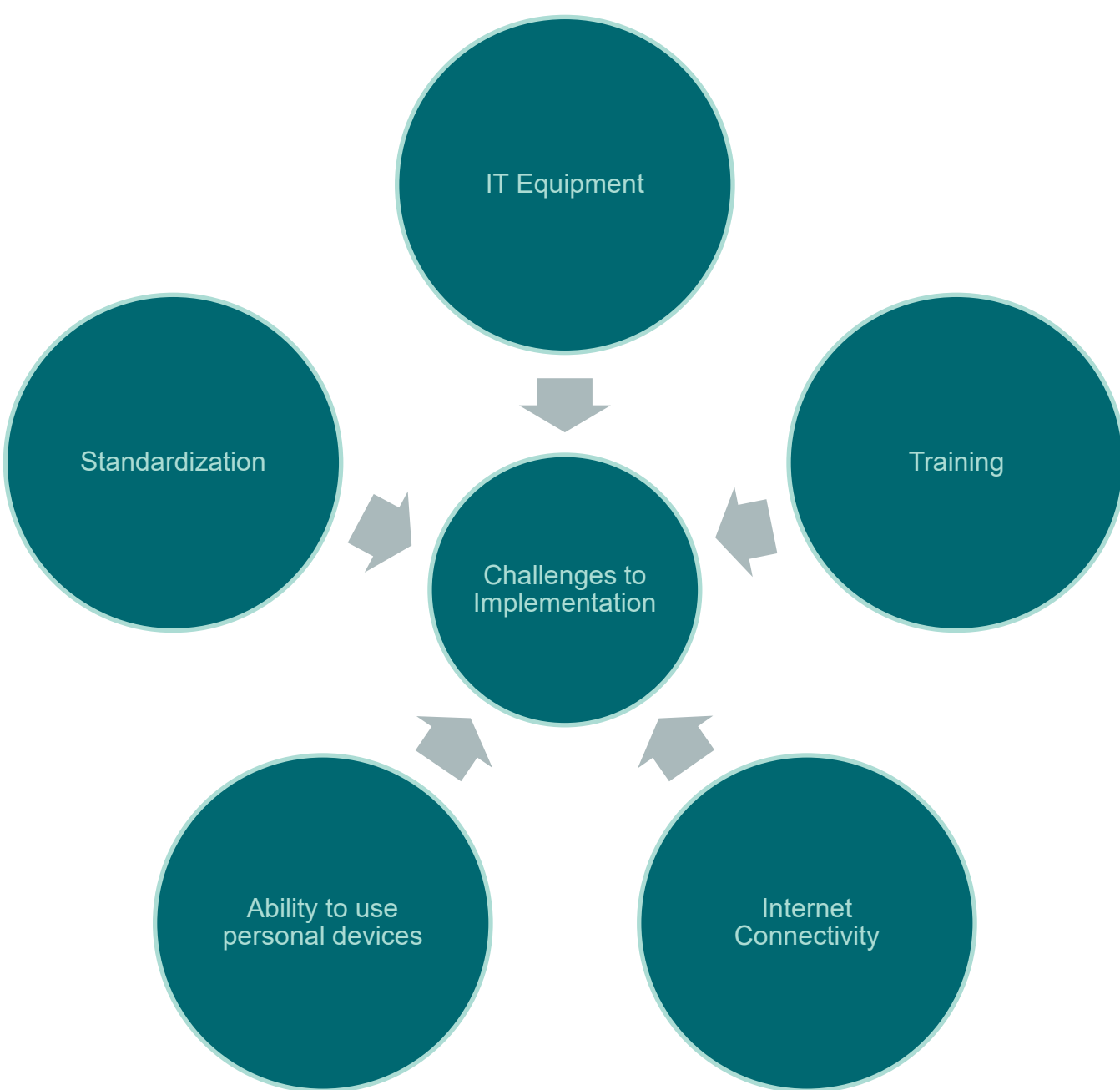


Figure 3. Challenging factors identified that hinder use of the digital ticksheet.

Challenges

The main challenges to broader implementation in many trusts has been the availability of IT equipment. For ease of use, two screens are recommended, and this was not always available to some departments or was room dependant. Although initially recording responses is notably slower, feedback suggested as clinicians became more comfortable with the digital ticksheet, recording became quicker. The introduction of the remote app to record responses was developed to help address this issue, however, some trusts had a no phone policy which meant that this solution wasn't available to them. Because the digital ticksheet relies on an internet connection, there are rare occasions times when the webpage would not load properly and in such cases the paper ticksheet remains a back-up option. It became apparent via the survey that there is no nationally agreed set of symbols or conventions for marking certain responses on a VRA ticksheet. Work towards standardising a nationally agreed symbol set, similar to those used in standard pure-tone audiometry would help with peer review and audit.

Conclusion

With over 90% of NHS Trusts¹ having implemented some form of electronic patient record system it is imperative that we can enter test results easily into the patient record and that this record contains robust and comprehensive information about the test procedure and patient condition that is easily auditable. In keeping with national aims to improve quality in paediatric audiology, digitising the VRA ticksheet has streamlined data collection and supports peer review of results. Whilst not without challenges in implementation, this innovation supports modernising delivery of paediatric audiology and can serve as a foundation for further digital tools in hearing assessment.

Acknowledgements

We would like to acknowledge and thank the clinicians from the following trusts for their invaluable feedback in helping develop and refine our ticksheet: Countess of Chester Hospital NHS Foundation Trust, Guys and St. Thomas' NHS Foundation Trust, Imperial College Healthcare NHS Trust, Mid & South Essex NHS Foundation Trust, North East London NHS Foundation Trust, Royal Hospital for Children, Greater Glasgow and Clyde, St George's University Hospitals NHS Foundation Trust, The Royal Wolverhampton NHS Trust & University College London Hospitals NHS Foundation Trust