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#### Declaration of competing interests

The Nottingham University Hospitals NHS Trust and University of Nottingham will receive a small royalty for future development work to future-proof the C2Hear content.

# Tackling information overload and retention – interactive multimedia videos for first-time hearing aid users

If you are an audiologist reading this article, how confident are you that all the information and advice that you offer your first-time hearing aid (HA) patients is understood, absorbed and then acted upon once they leave the comfort of your clinic room?

It has been suggested that 40-80% of information given in clinical appointments is forgotten afterwards [1]. We have shown that although 65% of practical information is recalled six weeks later, only 35% of psychosocial information is recalled, and not surprisingly, knowledge retention reduces with age [2]. It is not known how limited knowledge on hearing aid use and communication strategies contributes to non- or suboptimal hearing aid use, but it is suggested that around half (51%) of first-time hearing aid users have difficulties using their hearing aids. A typical statement is 'you get a lot of information... by the time you get home you've forgotten most of it' [3]. Delivery of high-quality

be used to visually demonstrate concepts and processes. They are based on pedagogical (educational) principles including interactivity to enable the user to engage with the learning materials, and can be replayed to optimise mastery of skills or knowledge. Research has shown that visual approaches can enhance learning and motivation in healthcare, but this concept has not, until now, been used in audiology.

#### Development of RLOs

The HEAR-IT RLOs were developed using a participatory community of practice approach, which involved hearing aid users and hearing healthcare professionals. This method was used to ensure that the RLO content was aligned to meet the end-users' needs, and included:

- i) An e-Delphi review of 33 hearing healthcare experts
- ii) Focus groups and workshops of 35 hearing aid users and 11 audiologists.

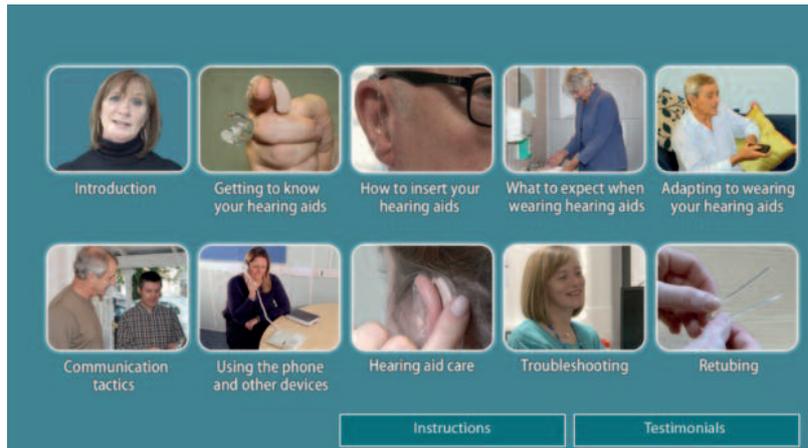
## *Feedback on the RLOs was extremely positive – the RLOs were rated as highly useful*

written information is recommended as good clinical practice [3, 4], but how often is this done? The manufacturer's user guide is given to most patients, but these are not optimal in terms of content, design and readability [5, 6]. Furthermore, there is not always time in a fitting appointment to give all the important information and advice that is needed to become a successful hearing aid user, and follow-up appointments are generally not offered routinely. So my third question is, is there another way to increase knowledge and understanding of the issues around hearing loss, hearing aids and communication?

In Nottingham, we have addressed this by developing a series of interactive, multimedia video tutorials (or reusable learning objects, RLOs). RLOs are short chunks of multimedia learning that can

As there were no published data on informational needs of first-time HA users, the aim of the e-Delphi review was to establish a consensus amongst professionals [7], from which key issues and topics were used to inform the next stage. Workshops provided an opportunity for hearing aid users and audiologists to conceptualise the RLO content by drawing visual representations of their thoughts and perspectives on storyboards. Data from the e-Delphi review, focus groups and workshops were integrated into the development of the RLOs.

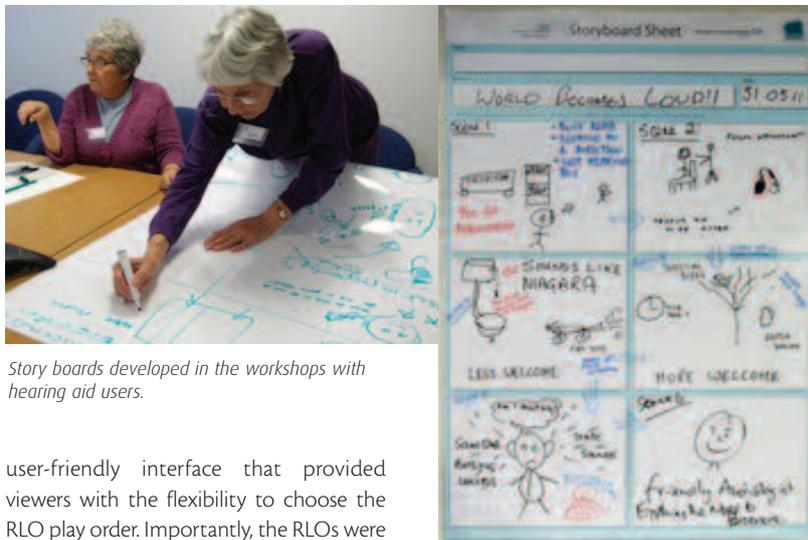
Each RLO included learning objectives, a range of visual imagery and sounds (illustrations, video clips, animations, photos, testimonials), and a commentary with subtitling. Interactive elements included a multiple-choice quiz with feedback and a



The choice of RLO is up to the user.



Stills from the RLOs.



Story boards developed in the workshops with hearing aid users.

user-friendly interface that provided viewers with the flexibility to choose the RLO play order. Importantly, the RLOs were reviewed by a panel of hearing aid users as well as audiologists, with iterative feedback incorporated to ensure user and clinical validity of the finished product.

RLOs were designed primarily for home delivery using DVD players because PC and internet use in the typical first-time hearing aid user age range (70-74 years) is relatively low (36% and 17% respectively) [8]. For the more IT-literate, there was the option to play the DVD through a PC or access the RLOs through the Nottingham Hearing Biomedical Research Unit internet portal.

### How effective are the RLOs?

The RLOs were evaluated in a randomised controlled trial of 203 first-time hearing aid users, with two arms (i) standard care plus RLOs (RLO+), or (ii) standard care only (RLO-). A total of 167 participants were evaluated six-weeks post-fitting to assess the benefits and the cost-effectiveness of the RLO intervention. In addition, three focus groups were held to gain a deeper understanding of users' thoughts and

perspectives on the RLOs, their value and future developments.

So what did the research find? There was high take-up and compliance with the RLOs (78% and 94% respectively). Around half the users watched the RLOs using a DVD for TV, a further 15% used DVDs for PC, and a third opted to use the internet. Interestingly, half the users referred back to the RLOs two or more times, some as many as seven times. This suggests that the RLOs were used as a tool to self-manage hearing loss and hearing aids, and to reinforce positive communication strategies [9].

Compared to the control RLO- group, the RLO+ group showed highly significant improvements in their knowledge of both practical and psychosocial issues relating to hearing and hearing aids, as well as significantly better practical hearing aid skills, particularly on cleaning the ear mould and using the phone, which can get overlooked in clinic due to time constraints. Although there was no improvement in overall

hearing aid use, there were significant improvements in hearing aid use in complex listening situations, such as having a conversation in a group, as well as overall use in suboptimal users (use <70%). Importantly, a health economic analysis showed the RLOs were a cost-effective intervention in 70% of cases.

Feedback on the RLOs was extremely positive, and the RLOs were rated as highly useful. The vast majority (>80%) of hearing aid users agreed that (i) they would return to the RLOs if they had a problem, (ii) the interactive quiz was useful to show what had been learned, (iii) the RLOs helped users feel more confident using their hearing aids, and (iv) they preferred the RLOs to written information. This meshed well with key focus groups themes that the RLOs were reassuring and provided reminders, as well as improving awareness of, and confidence in using hearing aids and communication tactics.

The majority (78%) reported that they would recommend the RLOs to others. This theme continued in the focus groups, where participants reported they had shared or given the DVD to others, in addition to watching the RLOs in the company of friends and family.

Following the intervention study and based on users' feedback, the RLOs have been refined so they are now 'market ready', with the brand name C2Hear.

### Where to next?

Because of the positive research findings, our goal is to get C2Hear into the clinic. Our view is that this will be best achieved if the RLOs are delivered directly by audiologists into the hands of hearing aid users as part of the hearing healthcare package. To maximise this approach, we have gone into partnership with PC Werth and Action on

Hearing Loss who will market and distribute the RLOs. C2Hear will be available to whoever wants them from autumn 2014. There will be a small cost to cover the cost of the manufacture, marketing and distribution, with PC Werth offering an introductory price of £1.20 to NHS audiology departments. We are also looking to make RLOs available online during 2015.

Future developments include RLOs specifically for communication partners (e.g. friends and family), and we are looking to develop the RLOs into highly interactive apps for use on smartphones and tablet PCs to future proof the content and concept. We have also examined the potential for using C2Hear to improve care home staff knowledge of hearing aids and communication in two student projects, with positive results. This opens up an opportunity to broaden the use of C2Hear to aid in the training of non-audiological professionals and carers.

Sample clips of C2Hear can be viewed on the Nottingham Hearing Biomedical Research Unit website (<http://www.hearing.nihr.ac.uk/>), click on 'Videos for hearing aid users' on the front page.

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#### Acknowledgements

Thanks to Will Brassington and Nottingham Audiology Services for trialling the RLOs, Heather Wharrad and the Health and Elearning Media team at Nottingham University, and all the hearing aid users who helped design the RLOs, in particular the patient panel. Finally, thanks to Marian Brandreth and Holly Thomas.

This article represents independent research funded by the National Institute for Health Research under the Research for Patient Benefit Programme (Grant ref. PB-PG-0909-2029). The views expressed are those of the author and not necessarily those of the National Health Service, the NIHR or the Department of Health.

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