

Research article

Nursing students' knowledge of working with D/deaf and hard of hearing patients: Evaluation of a deaf awareness elearning package

Julia Terry^{a,*}, Ruth Parkinson^b, Rhian Meara^c, Rachel England^a, Martin Nosek^a,
Ioan Humphreys^a, Andrew Howells^a

^a Swansea University, Faculty of Medicine, Health and Life Science, School of Health and Social Care, Swansea SA2 8PP, Wales, UK

^b Swansea University, Faculty of Medicine, Health and Life Science, Swansea University Medical School, Swansea SA2 8PP, Wales, UK

^c Swansea University, Faculty of Science and Engineering, School of Biosciences, Geography and Physics, Swansea SA2 8PP, Wales, UK



ARTICLE INFO

Keywords:
Deaf
Deaf awareness
eLearning
Nurse education

ABSTRACT

Aim: The aim of this study was to evaluate a newly developed Deaf awareness e-learning package with nursing students at one university in Wales, UK.

Background: D/deaf and hard of hearing communities face a multitude of barriers when accessing and receiving healthcare leading to under diagnosis of health conditions and poorer health outcomes in general. Lack of awareness, teaching, and exposure to the D/deaf and hard of hearing populations during health care professional training programmes has been shown to contribute to this health disparity.

Design: A descriptive cross-sectional design was used with two cohorts of undergraduate nursing students at one university in Wales, UK who were invited to undertake a Deaf awareness eLearning package developed with D/deaf communities in Wales.

Methods: Nursing student engagement and course completion were monitored, and evaluation survey questionnaires were implemented.

Results: The Deaf awareness eLearning package evaluation showed engagement with over 400 nursing students, who scored the package an overall mark (1 to 5 stars) of 4.72 out of 5. In total, 227 nursing students completed the eLearning package and received the certificate. Students reported finding the eLearning package very interactive, easy to navigate, thought the three-hour length was about right. However, we would like to know more about factors that influence student non-engagement and dropout.

Conclusions: These findings suggest that eLearning Deaf awareness programs can be successful in increasing knowledge and confidence around communicating with D/deaf and hard of hearing patients for nursing, with potential benefits for wider rollout across wider health and care student and staff populations.

Registration number: Grant number: 101010662\737073].

Tweetable abstract: D/deaf and hard of hearing patients experience barriers in healthcare so health professionals need accessible Deaf awareness training. Our eLearning model shows promise.

1. Introduction

The D/deaf and hard of hearing community makes up over 5 % of the world's population, with 1 in 10 people estimated to experience absence or decline of their sense of hearing by 2050 (World Health Organisation, 2024). In the United Kingdom, over 12 million adults are affected (Royal National Institute for Deaf People, 2024). Despite accounting for a large proportion of the population, D/deaf and hearing-impaired individuals

face increased barriers and difficulties in nearly every aspect of their lives, in comparison to their hearing peers. Worryingly, poor access and delivery of health care is still an internationally prevalent barrier faced by this population.

The term 'D/deaf' is used throughout this article. 'Deaf' refers to patients who primarily use sign language and identify with Deaf culture and the Deaf community, whereas 'deaf' refers to those who primarily use spoken English (or their native spoken language). People in either

* Corresponding author at: Swansea University, Swansea, West Glamorgan, UK.

E-mail addresses: j.terry@swansea.ac.uk (J. Terry), 2001683@swansea.ac.uk (R. Parkinson), R.H.Meara@Swansea.ac.uk (R. Meara), Martin.Nosek@Swansea.ac.uk (M. Nosek), I.Humphreys@Swansea.ac.uk (I. Humphreys), 2029096@swansea.ac.uk (A. Howells).

<https://doi.org/10.1016/j.nedt.2024.106446>

Received 8 April 2024; Received in revised form 11 September 2024; Accepted 1 October 2024

Available online 2 October 2024

0260-6917/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

group may use hearing aids or cochlear implants. The term ‘hard of hearing’ is used by a wide range of people; including older adults and those with mild hearing loss. It is worth noting that the identity of many Deaf patients is one of a belonging to a cultural minority group rather than being disabled (Grote et al., 2021).

Overall health is poorer in the D/deaf population than that of the general UK population. Common and treatable chronic conditions such as hypertension, diabetes and obesity are identified in larger proportion, with conditions under diagnosed, discussed less, and under-treated in the D/deaf population (Emond et al., 2015; Rogers et al., 2018). Poorer health and poorer health literacy in D/deaf populations can be attributed to communication barriers faced when accessing health care services, health information and receiving treatment (Alexander et al., 2012).

D/deaf people have reported difficulty communicating with their nurse/GP (RNID 2004), and did not feel it was worth booking a health appointment as communication was so poor (SignHealth, 2013, 2016). D/deaf people often report leaving a consultation and not understanding their condition due to communication barriers, and also avoiding health services due to poor past experiences (Shank and Foltz, 2019). Physicians have self-reported feeling uncomfortable in consultations with D/deaf patients, with both patient and health care provider reporting difficulty understanding each other (Abou-Abdallah and Lamyman, 2021). In one study over 60 % of nurses reported they often struggled to communicate with a deaf person (Ljubičić et al., 2017), suggesting more needs to be done to improve health worker communication with D/deaf populations.

Studies have reported D/deaf people’s unsatisfactory experiences in healthcare, with a lack of equity compared to hearing people regarding information and communication about health issues and health services (Kuenburg et al., 2016). Deaf people experience poorer physical and mental health than hearing people, with many negative experiences related to a lack of accessible information, unsatisfactory arrangements about British Sign Language (BSL) interpreter bookings, and health service staff having no Deaf awareness training and little knowledge of how to work with D/deaf patients (Emond et al., 2015).

Health professionals may be unaware of the preferred method of communication for a D/deaf patient. A large proportion of the D/deaf community may prefer a BSL interpreter to be present for health consultations, but this is only achieved in 7 % of emergency consultations (Reeves et al., 2002). No knowledge of how to book an interpreter is often cited as an excuse for this poor outcome (Foltz and Shank, 2020). Another common error is reliance upon a D/deaf patient’s family and friends to interpret health consultations for them, despite this being inappropriate and impinging on patient confidentiality (Public Health Wales, 2014). When surveyed, nearly a quarter of D/deaf patients reported utilising spoken English and lip reading, however none expressed a preference to communicate this way (SignHealth, 2013). Notably only 30 % of spoken English is readable on the lips, so errors in this communication method are frequent (Barnett, 2002). Almost half of the D/deaf community have reported communicating via notes, but none preferred to communicate via this method (SignHealth, 2013).

The *The Nursing and Midwifery Council (2023)* states nurses must “take reasonable steps to meet people’s language and communication needs, providing, wherever possible, assistance to those who need help to communicate their own or other people’s needs”. Similar outcomes are required by the governing bodies of other health care specialities, such as doctors and pharmacists (General Medical Council, 2020; General Pharmaceutical Council, 2017; Health and Care Professions Council, 2016); and the *UK Equality Act (2010)*. London. HMSO states the legal requirement to provide accessible healthcare with similar laws seen internationally.

The dissatisfaction of D/deaf people with the healthcare service seems global (Yet et al., 2022), likely due to lack of exposure during clinical training and practice with D/deaf communities. A census of 39 multi-disciplinary family health teams found only 3 % had received

specialised training during their undergraduate studies and over 80 % felt unprepared to communicate with D/deaf populations (de Santana Lima Reis and Maia dos Santos, 2019), with similar prevalence of D/deaf awareness training seen in senior nursing students. Furthermore, close to 9 out of 10 senior nursing students had never had contact with a D/deaf person by the end of their studies (Adib-Hajbaghery and Rezaei-Shahsavaroo, 2015).

Clearly there is a need to address the Deaf awareness knowledge gap for all frontline health workers (DoH, 2005; Terry, 2021; Hines, 2000; Steinberg et al., 2006; Reeves et al., 2002). Currently, there is no compulsory national Deaf awareness training that exists for nursing students in the UK, consequently students have inadequate knowledge of D/deaf culture and can display audist attitudes showing negative stigma towards D/deaf people (Gilmore et al., 2019). Notably, implementation of Deaf awareness training has been shown to improve knowledge, communication skills, interpreter knowledge, and attitudes towards D/deaf patients (Gilmore et al., 2019).

Many universities have shifted program elements towards digital learning platforms (Koch, 2014), with advantages including ease of access, flexibility for learners and greater amounts of information (Webb et al., 2017). Online learning has been shown to be effective for Deaf awareness training, for example Kruse et al. (2021)’s study describes the delivery of a live online workshop spread over three days which includes plenaries, lectures and small group sessions. Results indicated students improved their knowledge in all areas of Deaf awareness measured (Kruse et al., 2021).

This project had a patient-centred focus because D/deaf people report poor experiences in healthcare due to health professionals having little training how to work with D/deaf people. Nursing students were an ideal cohort group to begin evaluations on a newly developed eLearning Deaf awareness package developed in collaboration with Deaf communities in Wales. Nurses make up nearly 40 % of the total health workforce in the NHS, with patients spending nearly 90 % of their contact time with nursing staff, hence the decision to target nursing students at one university in Wales, UK, where introducing a Deaf Awareness course to their curriculum was a feasible option. We recognise that equipping students and health workers with knowledge is not enough to change outcomes, and that ensuring methods to implementing practical skills and to increase communication competencies is crucial. Our Deaf awareness eLearning package was a self-paced package which was timetabled but gave students the flexibility to complete this at a time suitable to them. ‘Deaf’ in the context of Deaf awareness training refers to both D/deaf and hard of hearing individuals, and so prepares health professional students to work with people with a range of experiences of being D/deaf.

2. Program design and data collection

Our overarching aim was to develop and design a scalable digital eLearning package to increase the knowledge of nursing students about how to work with D/deaf people who use health services and reduce negative perceptions of this clientele. This paper focuses on the descriptive cross-sectional study we undertook with two cohorts of nursing- students, with the objective being to evaluate nursing students’ experiences of using a Deaf awareness eLearning package. During the writing of this paper, we adhered to TREND (Transparent Reporting of Evaluations with Non-randomized Designs guidelines) (Des Jarlais, 2014).

Our key objectives for the whole project were to: 1) engage D/deaf people and key stakeholders to highlight the issues and barriers that D/deaf people experience using health services 2) identify the specific requirements for the digital eLearning package 3) design, develop and test the eLearning package as a pilot at one university site in Wales, UK with one health professional student group – Nursing students 4) determine how best to embed the self-directed eLearning package into health professional student programs. (This paper focuses on the reporting of

objective 3).

2.1. Ethical approval

The project was reviewed and approved by the School of Health and Social Care’s Research and Ethics Committee (Reference 191119c) in March 2022.

2.2. Design of the eLearning materials

Deaf awareness is best taught by D/deaf people who have personally experienced what nursing students need to learn about communicating with D/deaf and hard of hearing patients. Knowing there are over 9000 health professional students in Wales, and that face-to-face teaching across all Welsh universities was unfeasible, an agreed D/deaf-led eLearning package was the project aim, which included D/deaf people’s stories, advice and information with interactive components and in-built assessment. The eLearning course was designed and developed by subject experts which included project steering group members from Deaf charities, D/deaf professionals, D/deaf lay members, a range of health staff and students to ensure hard of hearing perspectives, and faculty students (see Fig. 1). Employing a Research Assistant who was D/deaf was key in connecting with D/deaf communities, contextualising participant experience (Terry et al., 2024), and developing Deaf Awareness package content. Our D/deaf consultant was part of the steering group, regularly teaches Deaf awareness and scrutinised the Deaf Awareness eLearning package for accuracy and content, providing many further suggestions for inclusion. Key content for the eLearning package was sourced from data at ten focus groups across Wales with D/deaf communities at local Deaf clubs, which is reported elsewhere (Terry and Meara, 2023). The content for the Deaf awareness eLearning package is presented in Table 1.

2.3. Participants and recruitment

In discussion with Nursing program and module leads, it was agreed to situate the self-directed eLearning package within the BSc Nursing program, with it timetabled, and with reminders for students to complete, as well as brief information bringing it to the students’ attention at module start. Aware of the volume of self-directed learning, in-person class reminders and email nudges were also sent to students. The eLearning package was situated on the main student virtual learning platform, Canvas, which was familiar to students in terms of layout and design.

Participant groups were determined by discussion at the outset with



Fig. 1. Development of Deaf awareness eLearning package.

Table 1
Content of Deaf awareness eLearning package.

Section	Content
Introduction	Welcome to the course Context: Deaf people experience many barriers in health services Heads up: course content Learning outcomes:
Section One: Bridging the gap	<ul style="list-style-type: none"> To review how best to communicate with people who are Deaf or hard of hearing To examine the impact of Deafness and being hard of hearing To clarify access issues Deaf and hard of hearing people experience in health services and work to reduce these barriers Highlighting certificate on completion and how to start.
Section Two: Everyday Deaf experiences	Key statistics, definitions of deafness, communication, and speech, what is small d deaf and Big D Deaf, Deaf communities, Deaf education, hearing aids, loop systems, cochlear implants, Methods of communication, British Sign Language, Children of Deaf Adults (CODAs), Quiz. Access issues, newborn hearing screening, why people become d/Deaf, social model of disability, radio aids, campaigns, impact of Deafness on people’s lives, <i>Silent child</i> short film, famous Deaf people, Quiz.
Section Three: Deaf and hard of hearing people in healthcare settings	Why Deaf people’s access to healthcare is an issue, reflections on Deaf patients you have met, Deaf people’s stories about i) biggest barriers faced in healthcare ii) impacts of health service experiences iii) knowing what would make a positive difference to Deaf patients’ experiences in healthcare iv) idea of basic ‘I know basic BSL’ badge for health staff. Working with BSL interpreters and how to book one in Wales, NHS 111 BSL video relay service, links to NMC proficiencies, Do’s and don’ts, BSL basic greetings signs, BSL medical and health signs, lip reading exercise, final summary.
Assessment and evaluation:	Ten question quiz – unlimited attempts

Head of Nursing and Head of School aiming to benefit students but delivered at a strategic point so as not to disrupt their studies or existing assignments. The Deaf awareness eLearning package was evaluated at one university in Wales, UK, and was only accessible at that time to students who had been enrolled onto the eLearning course.

2.4. Evaluating the eLearning deaf awareness program

Details to access the Deaf awareness eLearning package were posted on the students’ learning platform, which took them to an introduction page informing them of the course content, and what was required at the outset. The course was intended as a 3-h self-directed eLearning package, similar in length to other online learning resources in the participating students’ BSc Nursing program.

Data from two cohorts was gathered during pilot phase (Feb/March 2023) & (April/May 2023) providing three sets of data:

1. Package evaluation as a part of Certificate of Completion process.
2. Data from Learning Platform Canvas – quiz completion, active learners.
3. Survey data: student experience of the Deaf awareness eLearning package.

Descriptive evaluation measures used included student time spent on eLearning program, engagement and dropout, and certificate completions (once students had final assessment completed correctly).

Microsoft Forms software was used as basic evaluation measures were collected. Basic participant characteristics were not collected as not deemed relevant to the study. No comparative measures were used.

Researchers and our Online Learning Officer were able to monitor student engagement in the eLearning package. After each of the three sections of the package there was a short three question formative quiz, which led to the final summative quiz of ten questions. Students needed to get all ten questions correct to receive their certificate and could have as many attempts as needed. The certificate of program completion was downloadable upon answers to short evaluation questions. Activities intended to increase student compliance were email reminders during the module. During the eLearning package there were also free text opportunities for students to reflect on their feelings in relation to learning activities (for example when there was intentionally no audio available for a video), and on their experiences with Deaf and hard of hearing patients in placement settings.

Additionally, students had the opportunity to engage in further research elements and were invited to complete a short descriptive survey about their experiences using a qualitative approach (using Qualtrics software) and if they wished, to be entered into a prize draw to win a £25 Amazon voucher. The decision for a separate more detailed survey was to avoid student burden. We wanted students to have the opportunity to access and complete the Deaf awareness eLearning package without being obliged to complete several evaluation questions, hence the survey being available through a separate link, giving students choice to participate in the survey or not. The survey questions asked students to respond to a Likert scale in terms of their perceived level of agreement and disagreement to statements about the eLearning layout, package navigation, time length, level of interactivity, knowledge, information and difficulty level.

3. Results of evaluation of eLearning package with nursing students

The Deaf awareness eLearning package evaluation was accessible to over 500 students, in that they were automatically enrolled onto the course during their taught modules at that time period. Engagement with the course material was defined as a click to open it and view material shown on the system in minutes. Students who showed some level of engagement and rated the package, with an overall mark (1 to 5 stars) scoring it as an average of 4.72 out of 5. In total 227 nursing students (out of a potential 516) completed the eLearning course and received the certificate.

From the basic evaluation that all student completers engaged in, 98 % of nursing students agreed/strongly agreed that the eLearning package was easy to follow and to navigate. 96 % of students who completed the package reported feeling more confident to communicate with D/deaf patients because of engaging in the eLearning package. In terms of eLearning package length, 92 % of student agreed/strongly agreed the 3-

h length was about right.

Fig. 2 below shows nursing student engagement with the eLearning package overall for each cohort. In cohort one, 196 nursing students out of a possible 245 were actively engaged on the eLearning package, and in cohort two 209 out of a possible 271 were active. Deaf awareness package completions were 67 % ($n = 132$) for cohort one and 45 % ($n = 95$) for cohort two. Average time in minutes spent on the eLearning package were 84.5 min (cohort one) and 49 min (cohort two). Differences in engagement levels may be due to the way in which the opportunity to take part in the Deaf Awareness eLearning was introduced and monitored.

Fig. 3 below presents students actual final assessment quiz attempts, with 166 out of 196 active students attempting the final assessment (cohort one); and 135 out of 209 active students in cohort two. A higher dropout rate is seen in cohort two, with less certificates issued (as fewer final assessment completions).

Students highlighted factors that were helpful in them knowing about and accessing the Deaf awareness eLearning package (see Table 2), suggesting that having the self-directed learning timetabled, a video in the module introduction and regular electronic reminders were useful in engaging their interest.

The additional student survey had a low number of responses, possibly due to it being posted separately to the eLearning course and are presented in Table 3 below. In total 22 nursing students completed the survey out of a potential 405 students who were active on the eLearning package across both cohorts. In summary, students generally agreed/strongly agreed the layout was easy to find their way around, and to navigate. In the main students viewed the time length as about right and reported their knowledge about working with Deaf people had improved. The majority of students who responded agreed that the Deaf awareness eLearning package would also be suitable for other health professional student groups.

The survey also gave participants the options to respond with free text comments, with examples below in Table 4. This option was Out of 52 posted comments, five highlighted that they would have preferred an in-person session for this topic. 12 out of 52 posted comments mentioned said they enjoyed the learning Sign language elements, and expressed an interest in learning more BSL.

As part of the evaluation process, 52 out of 227 nursing students who completed the package posted comments about their experiences of using the eLearning package, which can be seen in Table 4 below.

Apart from two students, none reported having engaged in any Deaf awareness training in the past.

4. Discussion

This project has resulted in the development of a Deaf awareness eLearning package which has the potential to be a valuable education tool to inform nursing students' and the wider professionals network

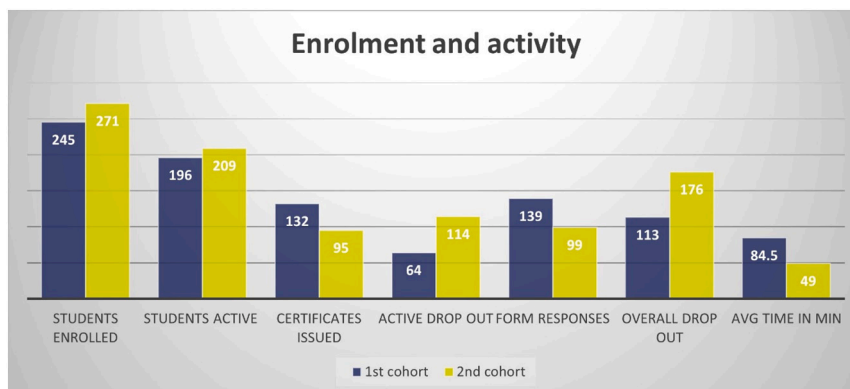


Fig. 2. Student engagement and activity with eLearning package.

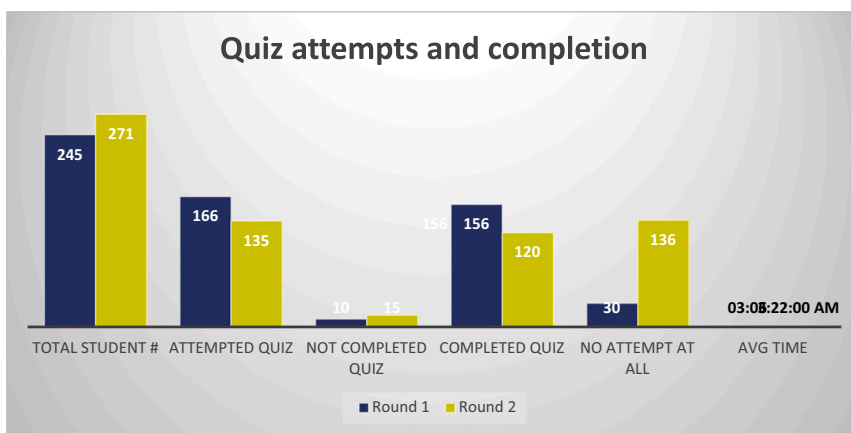


Fig. 3. Student attempts at final quiz and completions.

Table 2

Factors students reported as helpful in knowing about/accessing the eLearning package.

Did any of the following help you in knowing about, reminding you or accessing the Deaf awareness course in your module? Click all that apply:	Cohort 1	Cohort 2
Canvas announcements reminding students to complete the eLearning package	14	2
Other students talking about it	3	1
Seeing a short video about the eLearning package in the module introduction/on Canvas	10	1
Seeing it as self-directed learning on the timetable	14	3
The module leader talking about it at the start of the module introduction with slides	9	1

knowledge and practice when working with D/deaf patients in health-care settings. In this section we discuss the results of this study in line with aspects of eLearning delivery more broadly considering student engagement, interactivity, navigation of eLearning and feedback, as well as limitations of this study.

To emphasise the difference, eLearning is usually self-directed by the student, whereas online learning requires teachers to be online at the same time as students (Lister, 2014). ELearning has evolved and successfully been incorporated in many organisations now, including private, public, corporate, and educational settings (Bramer, 2020). While certain subjects within pre-registration nursing education are now delivered via eLearning, researchers note that active engagement of students is the key to success, along with teacher-student communication and students feeling valued and involved (Jowsey et al., 2020).

There is currently a paucity of literature about how Deaf awareness training is delivered to health professional student groups during their initial training, with many students having no content at all (Terry and Meara, 2023; Gilmore et al., 2019). From the outset the steering group wanted the project to be D/deaf-led where possible, and content in the eLearning program to be authentic, and relevant to the Welsh context in terms of policy and how services are organised. This study suggests that working with Deaf communities, D/deaf professionals and D/deaf researchers considerably improved the quality of the project, as well as the content of the actual eLearning package.

Potentially health professional staff in Wales can access a short Deaf awareness module (approximately 15 min in length) via the NHS Wales electronic staff record, but this provides limited content and lacks much of the information contained in our Deaf awareness eLearning package. Notably if the third sector and statutory services in Wales, (such as Local Authority Councils) request Deaf awareness training, they ask Deaf charities who will teach groups of approximately 10–20 people. However, the feasibility of training being delivered face to face across Wales

to all Welsh universities with health professional students ($n = 9000$) (and potentially NHS staff – $n = 200,000$) by any Deaf charity or organisation is impossible. We knew from the outset that an interdisciplinary approach, time, and significant funding would be needed to develop a Deaf awareness eLearning package that could then be tested on one health professional student group to evaluate results in the first instance.

Aware that active student engagement is key to eLearning success, our project showed variable results regarding students' engagement. There was a difference in recruitment methods as the first cohort were a September cohort and the second cohort were a March cohort, which denotes timetable differences across the year. The second cohort had already started their taught module when the notion of the Deaf Awareness eLearning was introduced, due to a timetabling error and a lack of awareness of the time span of the module, so the opportunity to introduce the Deaf awareness package at the module introduction was missed. Notably the first cohort had information about the Deaf awareness eLearning package in their seven-week teaching block's module introduction with a short two-minute video explaining why the package was relevant, and at least three reminder emails and one in-person reminder to engage in the eLearning. For the first cohort, students experienced the self-directed learning timetabled mid-module, with 67 % of active students completing the eLearning program. However, the second cohort experienced their taught module over a longer time span, due to non-term time mid-module, and the eLearning timetabled near the module end, and whilst they did have an email reminder to complete the eLearning, they did not have an overview during the module introduction, nor an in-person reminder as neither were available at that time. The second cohort data showed 45 % of active students completed the eLearning, which were much lower completions than cohort one, suggesting an introduction about the eLearning about the module start and subsequent reminders both electronically and in-person were of value. Whilst the survey responses were low in number, students did highlight that having information about the eLearning during the module introduction, and regular reminders did indeed prompt them to complete it.

In terms of active students, a third of cohort one and more than half of students in cohort two did not engage with the eLearning package at all, and reasons for this are unknown as no data was collected in relation to non-participation. According to Rajabalee et al. (2020), it is often high performing students compared to low performers who are more likely to engage with eLearning programs. Students need to perceive that eLearning is worth their time and effort and may be more likely to engage with learning when it is part of summative assessments, and perhaps not seen as optional. Whilst students in this study were informed the Deaf awareness eLearning was part of their required module, they were not required to evidence the certificate as part of their degree progression at the time of the study.

Table 3
Responses to additional research evaluation questions.

Statement	Responses Cohort 1 n = 19)	Responses Cohort 2 (n = 3)
I found the layout of the eLearning package was helpful and easy to find my way around		
Agree	13	–
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	2	1
Somewhat disagree	1	–
Strongly agree	3	2
Strongly disagree	–	–
In general, the Deaf awareness package pages were easy to navigate		
Agree	8	1
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	4	1
Somewhat disagree	1	–
Strongly agree	6	1
Strongly disagree	–	–
I think three hours was the right time length needed to complete Deaf awareness package		
Agree	7	–
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	5	1
Somewhat disagree	4	–
Strongly agree	3	2
Strongly disagree	–	–
The Deaf awareness package had about the right level of interactivity for students		
Agree	11	1
Disagree	2	–
Neither agree nor disagree	3	–
Somewhat agree	2	1
Somewhat disagree	–	–
Strongly agree	1	1
Strongly disagree	–	–
I found the Deaf awareness package improved my knowledge of working with people who are Deaf		
Agree	8	2
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	2	–
Somewhat disagree	–	–
Strongly agree	9	1
Strongly disagree	–	–
The Deaf awareness package contained information I did not know before		
Agree	10	1
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	–	–
Somewhat disagree	–	–
Strongly agree	9	2
Strongly disagree	–	–
I think the Deaf awareness package could be used by other student health professional groups		
Agree	10	1
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	1	–
Somewhat disagree	–	–
Strongly agree	8	2

Table 3 (continued)

Statement	Responses Cohort 1 n = 19)	Responses Cohort 2 (n = 3)
Strongly disagree	–	–
The final assessment was about right in terms of difficulty		
Agree	9	–
Disagree	–	–
Neither agree nor disagree	–	–
Somewhat agree	3	1
Somewhat disagree	–	–
Strongly agree	6	2
Strongly disagree	–	–
Missing data	1	–

According to [Pintz et al. \(2021\)](#), the use of interactive exercises helps ensure students are actively engaged in their eLearning through the use of multimedia content, which includes scenarios, feedback methods and integrated videos. We know eLearning programs need to be more than a PowerPoint presentation on a training platform, as nursing students report wanting to feel immersed and engaged in their learning so they feel they can translate new knowledge and understandings into effective care for their patients ([Mak and White, 2021](#)). Virtual learning environments where eLearning courses are situated need to present materials in a variety of ways to accommodate different learning styles and therefore encourage greater engagement by students ([Hart and Rush, 2007](#)). For our project the students existing VLE (Canvas) was used, which they had familiarity with for more than two years. The eLearning program was well designed by our online learning officer, with regular and informative feedback from critical friends on the steering group including a Deaf consultant. Both our D/deaf research assistant and D/deaf consultant have experience of teaching Deaf awareness.

The majority of student participants in this project indicated that they found the eLearning package easy to navigate. According to [Alshehri et al. \(2019\)](#), a set of usability principles for eLearning was developed that has had an influence in student learning processes. The principles include system navigation, system learnability (ease of learning, link predictability), visual design, information quality, instructional assessment and system interactivity (between students and teachers), which suggested to the team many elements of the eLearning package were navigable.

However, it is notable that the eLearning package was timed to take around three hours, but student averages showed cohort one engaged for only half that time, and cohort two only around one third of that time. This may suggest many elements were skipped, videos perhaps not viewed in their entirety, and maybe formative quizzes omitted. It is possible in eLearning courses to disable forward seeking (or skipping ahead) on eLearning, but equally students may favour the flexibility to skip ahead, as eLearning does provide a convenient and flexible way for individuals to acquire knowledge and skills ([Fayzulloeva, 2023](#)). Some learners may feel with skim reading that they were still able to answer the final assessment questions and complete the course, again that was not data that we collected.

Even though survey respondents were low, five comments included suggestion that the course be taught, or include face to face elements, which suggests a request from students for deeper learning approaches. As Deaf awareness does focus extensively on physical practice of visual communication, some in-classroom follow up would likely work well, particularly if this were to include basic BSL signing and perhaps case study scenarios so students could discuss how they would implement patient care in their own fields of nursing. The study team are aware that self-directed eLearning is limited in its ability to enable learner-to-learner interaction and would ideally be complemented by opportunities for dialogue within an interprofessional team ([Grosser et al., 2020](#)). Disadvantages of eLearning include the lack of face-to-face

Table 4

Free text comments from nursing student survey of Deaf awareness eLearning package.

Really good package, learnt a lot about communicating with individuals who are deaf and feel it will be beneficial for my nursing practice.

Possibly hold a short face to face lecture to learn basic BSL greetings and medical terms that are relevant to each field of practice

Really good course, the videos were great to aid understanding of the topics

some videos are a little too long my concentration was a little lost but that's just me personally

I now feel slightly more confident to communicate with D/deaf/Hard of hearing patients, but I would still be nervous if the patient was to only use sign language. However, this has inspired me to learn more general sign language.

A very useful learning package - easy to navigate and understand, small quiz throughout was helpful in order to test learning before final quiz.

this was very interesting, and it would be a good idea for all health care professionals to learn BSL

communication with experts on the learning topic, the lack of communication skill development and the limited feedback, and students often overwhelmed by too much course content (Al Rawashdeh et al., 2021).

Formative eLearning can encourage engagement as it provides opportunities for practice, and survey respondents did make mention that they found the end of each eLearning formative learning quizzes helpful. Each were set up in a way that if students gave an incorrect response, they would get immediate feedback guiding them forward, and not just that their answer was incorrect.

Active dropout rates were recorded, with 32 % of cohort one ($n = 64$) and 54 % of cohort two ($n = 113$) who logged in and started the eLearning package but did not progress to completion. Inactivity and student passivity online are understood as symptoms of disengagement and predictors of negative outcomes, such as dissatisfaction and dropout (Dennen, 2008; Lee and Choi, 2011). A common feature of many online courses are grading systems that reward participation (Morgan-Thomas and Dudau, 2019; Rollag, 2010). Therefore, fostering activity has become the implicit aim of eLearning design and instructors are being urged to eliminate passivity to combat disengagement and disaffection in eLearning (Redpath, 2012).

Feedback from students who dropout is important going forward in the development of educational materials, and the project team note this for future delivery. We also note that a larger cohort, and using a variety of sites and different health professional student groups could potentially provide a clearer indication of the impact of this Deaf awareness eLearning package. It will also be important to gather more data, particularly feedback from non-completers and non-participants, to improve the package and student engagement and completion.

4.1. Limitations

Our study has some limitations. First, conditions for cohort one differed to cohort two, as students in cohort were studying a differently paced module and did not have the information about the Deaf awareness eLearning package at module start, nor frequent reminders to complete, which may have impacted on completion rates. Second, there was a lack of a randomized control group which limits the strength of the reported findings. Third, the study was cross-sectional and intended as an evaluation of the eLearning package, but without a pre-test and post-test there was no measure of the learning. As few students reported any prior Deaf awareness training, it is possible that significant increases in knowledge would have been evident, so this was a missed opportunity. Fourth, while mindful of student burden, having the research survey posted separately for students meant extra effort was required to complete this, and with hindsight linking evaluation responses to certificate obtainment would have greatly increased response rates. Fifth, knowing reasons for student non-participation or non-completion would help in eLearning package development for the future.

Whilst nursing students have several mandatory training elements as part of their pre-registration nurse education, having this Deaf awareness eLearning supported by commissioners as a mandatory element would significantly increase completion rates.

5. Conclusions and recommendations

The importance of an available and flexible Deaf awareness eLearning package that is available to nursing students has potential to improve Deaf awareness in one group of health professional learners. The results of this study support investment in interactive Deaf awareness eLearning that provides learners with opportunities to improve their knowledge of Deaf and hard of hearing patients and understanding how to effectively communicate with them as well as learn about the richly cultured D/deaf community, how to book a BSL/English interpreter and to learn more about the challenges D/deaf people face daily, and particularly in mainstream health services. There is scope to improve the current Deaf awareness eLearning package to make it more accessible with Welsh translation, in-screen BSL, and a greater diversity of D/deaf people's stories.

However, understanding human factors that impact on student engagement in eLearning in relation to this Deaf awareness eLearning package are vital to ensure deep learning and actual positive impacts experienced by Deaf and hard of hearing patients in practice settings.

Funding

This work was supported by the Burdett Trust for Nursing, A nurse-led improvement project in digital health [Grant number: 101010662 \737073].

CRediT authorship contribution statement

Julia Terry: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Ruth Parkinson:** Writing – review & editing, Writing – original draft, Visualization, Resources. **Rhian Meara:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation. **Rachel England:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation. **Martin Nosek:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Ioan Humphreys:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis. **Andrew Howells:** Writing – review & editing, Resources.

Conflicts of interest

None to report

Acknowledgements

Our project team would like to extend a heartfelt thank you to all the Deaf individuals and communities who took part in this project, as well as the steering group - we could not have done this without you.

References

- Abou-Abdallah, M., Lamyman, A., 2021. Exploring communication difficulties with deaf patients. *Clin. Med.* 21 (4), e380–e383.
- Adib-Hajbaghery, M., Rezaei-Shahsavari, Z., 2015. Nursing students' knowledge of and performance in communicating with patients with hearing impairment. *Japan journal of nursing science* : JJNS 12 (2), 135–144. <https://doi.org/10.1111/jjns.12057>.
- Al Rawashdeh, A.Z., Mohammed, E.Y., Al Arab, A.R., Alara, M., Al-Rawashdeh, B., 2021. Advantages and disadvantages of using e-learning in university education: analyzing students' perspectives. *Electronic Journal of E-learning* 19 (3), 107–117.
- Alexander, A., Ladd, P., Powell, S., 2012. Deafness might damage your health. *Lancet (London, England)* 379 (9820), 979–981. [https://doi.org/10.1016/S0140-6736\(11\)61670-X](https://doi.org/10.1016/S0140-6736(11)61670-X).
- Alshehri, A., Rutter, M., Smith, S., 2019. Assessing the relative importance of an E-learning System's usability design characteristics based on Students' preferences. *Eurasian J. Educ. Res.* 8 (3), 839–855.
- Barnett, S., 2002. Communication with deaf and hard-of-hearing people: a guide for medical education. *Academic Medicine* 77 (7), 694–700.
- Bramer, C., 2020. Preregistration adult nursing students' experiences of online learning: a qualitative study. *Br. J. Nurs.* 29 (12), 677–683.
- de Santana Lima Reis, V., Maia dos Santos, A., 2019. Knowledge and experience of family health team professionals in providing healthcare for deaf people. *Revista CEFAC*. 21. <https://doi.org/10.1590/1982-0216/20192115418>.
- Dennen, V.P., 2008. Pedagogical lurking: student engagement in non-posting discussion behavior. *Comput. Hum. Behav.* 24 (4), 1624–1633.
- Department of Health, 2005. Mental health and deafness: towards equity and access. http://webarchive.nationalarchives.gov.uk/ukgwa/20130123204230/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4103995.
- Des Jarlais, D.C., 2014. TREND (Transparent Reporting of Evaluations with Nonrandomized Designs). A User's Manual, Guidelines for Reporting Health Research, pp. 156–168.
- Emond, A., Ridd, M., Sutherland, H., Allsop, L., Alexander, A., Kyle, J., 2015. The current health of the signing deaf community in the UK compared with the general population: a cross-sectional study. *BMJ Open* 25;5(1):e006668. <https://doi.org/10.1136/bmjopen-2014-006668>.
- Fayzulloeva, C., 2023. Importance of E-learning in Credit module system. *Инновационные исследования в современном Мире: теория и практика* 2 (23), 12–16.
- Foltz, A., Shank, C., 2020. Deaf sign-language using Patients' experiences in health emergencies in Wales: perspectives for improving interactions. *Frontiers in Communication*. 5, 1–6. <https://doi.org/10.3389/fcomm.2020.572855/full>.
- General Medical Council. (2020) Outcomes for Graduates. Retrieved from <https://www.gmc-uk.org/education/standards-guidance-and-curricula/standards-and-outcomes/outcomes-for-graduates/outcomes-for-graduates/about-the-outcomes>.
- General Pharmaceutical Council. (2017) Standards for Pharmacy Professionals. Retrieved from https://www.pharmacyregulation.org/sites/default/files/standards_for_pharmacy_professionals_may_2017_0.pdf.
- Gilmore, M., Sturgeon, A., Thomson, C., Bell, D., Ryan, S., Bailey, J., McGlade, K., Woodside, J.V., 2019. Changing medical students' attitudes to and knowledge of deafness: a mixed methods study. *BMC Med. Educ.* 19 (1), 227. <https://doi.org/10.1186/s12909-019-1666-z>.
- Grosser, J., Bientzle, M., Kimmerle, J., 2020. A literature review on the foundations and potentials of digital teaching scenarios for interprofessional health care education. *Int. J. Environ. Res. Public Health* 17 (10), 3410. <https://doi.org/10.3390/ijerph17103410>.
- Grote, H., Izagaren, F., O'Brien, V. (2021). How to communicate with patients who are D/deaf or have hearing loss. *BMJ* 2021;373:n1382. <https://doi.org/https://doi.org/10.1136/bmj.n1382>.
- Hart, M., Rush, D., 2007. Open source VLEs (MOODLE) and student engagement in a blended learning environment. In: In 2007) ICEL2007 2nd international conference on E-learning (pp. 213–222).
- Health and Care Professions Council, 2016. Standards of Conduct, performance and ethics. Retrieved from. <https://www.hcpc-uk.org/standards/standards-of-conduct-performance-and-ethics/>.
- Hines, J., 2000. Communication problems of hearing-impaired patients. *Nursing standard Royal College of Nursing* 14 (19), 33–37. <https://doi.org/10.7748/ns2000.01.14.19.33.c2752>.
- Jowsey, T., Foster, G., Cooper-Ioelu, P., Jacobs, S (2020). Blended learning via distance in pre-registration nursing education: A scoping review. *Nurse Educ Pract.* 2020 Mar; 44:102775. doi: <https://doi.org/10.1016/j.nepr.2020.102775>. Epub 2020 Mar 25. PMID: 32247200; PMCID: PMC7195119.
- Koch, L.F., 2014. The nursing educator's role in e-learning: a literature review. *Nurse Educ. Today* 34, 1382–1387. <https://www.sciencedirect.com/science/article/abs/pii/S0260691714001117?via=ihI>.
- Kruse, J., Zimmermann, A., Fuchs, M., Rotzoll, D., 2021. Deaf awareness workshop for medical students - an evaluation. *GMS journal for medical education* 38 (7), Doc118. <https://doi.org/10.3205/zma001514>.
- Kuenburg, A., Fellingner, P., Fellingner, J., 2016. Health care access among deaf people. *J. Deaf Stud. Deaf Educ.* 21 (1), 1–10.
- Lee, Y., Choi, J., 2011. A review of online course dropout research: implications for practice and future research. *Educ. Technol. Res. Dev.* 59, 593–618.
- Lister, M., 2014. Trends in the design of e-learning and online learning. *J. Online Learn. Teach.* 10 (4), 671.
- Ljubičić, M., Zubčić, S. & Šare, S. (2017). Communication between nurses and deaf people in health institutions. *CBU international conference proceedings.* 5. 10.12955/cbup.v5.1052.
- Mak, V.J., White, P.J., 2021. The development of an elearning program on the response and recognition of the deteriorating patient using self-study methodology. *Nurse Educ. Pract.* 50, 102955.
- Morgan-Thomas, A., Dudau, A., 2019. Of possums, hogs and horses: capturing duality of student engagement in eLearning. *Acad. Manag. Learn. Educ.* <https://doi.org/10.5465/amle.2018.0029>.
- Pintz, C., Posey, L., Farmer, P., Zhou, Q.P., 2021. Interprofessional care of people with multiple chronic conditions: an open-access resource for nursing educators. *Nurse Educ. Pract.* 51, 102990.
- Public Health Wales, 2014. Accessible healthcare for people with sensory loss in Wales. <https://phw.nhs.wales/services-and-teams/equality-and-human-rights-information-resource/all-wales-standards-for-accessible-communication-and-information-for-people-with-sensory-loss/accessible-healthcare-for-people-with-sensory-loss-in-wales/>.
- Rajabalee, B.Y., Santally, M.I., Rennie, F., 2020. A study of the relationship between students' engagement and their academic performances in an eLearning environment. *E-learning and Digital Media* 17 (1), 1–20.
- Redpath, L., 2012. Confronting the bias against on-line learning in management education. *Acad. Manag. Learn. Educ.* 11 (1), 125–140.
- Reeves, D., Kokoruwe, B., Dobbins, J., Newton, V., 2002. Access to Primary Care and Accident & Emergency Services for Deaf People in the North West (A report for the NHS Executive North West Research and Development Directorate).
- Rogers, K.D., Ferguson-Coleman, E., Young, A., 2018. Challenges of Realising patient-Centred outcomes for deaf patients. *The patient* 11 (1), 9–16. <https://doi.org/10.1007/s40271-017-0260-x>.
- Rollag, K., 2010. Teaching business cases online through discussion boards: strategies and best practices. *J. Manag. Educ.* 34, 499–526.
- Royal National Institute for Deaf People, 2024. Prevalence of deafness and hearing loss. Retrieved from. <https://rnid.org.uk/get-involved/research-and-policy/facts-and-figures/prevalence-of-deafness-and-hearing-loss/#:~:text=One%20in%20five%20adults%20in,0000%20people%20in%20Northern%20Ireland>.
- Royal National Institute for the Deaf, 2004. A Simple Cure: A National Report into Deaf and Hard of Hearing People's Experiences of the National Health Service (RNID).
- Shank, C., Foltz, A., 2019. November. Health and wellbeing for deaf communities in Wales. Scoping for a Wales-wide survey. In: It Makes Sense Conference: Sensory Loss Awareness Month. Bangor University.
- SignHealth, 2013. Research into the Health of Deaf People. Research Study Conducted by Ipsos MORI for Sign Health. <https://signhealth.org.uk/wp/wp-content/uploads/2019/07/SignHealth-Deaf-Health-Survey-Report-1.pdf>.
- SignHealth, 2016. Sick of it: how the health service is failing deaf people. <https://signhealth.org.uk/wp-content/uploads/2016/09/Sick-Of-It-Report.pdf>.
- Steinberg, A.G., Barnett, S., Meador, H.E., Wiggins, E.A., Zazove, P., 2006. Health care system accessibility. Experiences and perceptions of deaf people. *J. Gen. Intern. Med.* 21 (3), 260–266. <https://doi.org/10.1111/j.1525-1497.2006.00340.x>.
- Terry, J., 2021. Developing networks to improve practice, policy and education with Deaf communities. In: *Clinical Psychology Forum*, No 348, December 2021. Special issue: Deafness and hearing loss.
- Terry, J., Meara, R., 2023. A Scoping Review of Deaf Awareness Programs in Health Professional Education. *Plos Global Public Health.* <https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0002818>.
- Terry, J., Meara, R., England, R., 2024. They Still Phone Even though they Know I'm Deaf. In: *Exploring Experiences of Deaf People in Health Services in Wales.* Plos Global Health, UK. <https://doi.org/10.1093/pubmed/fdae112>.
- The Nursing and Midwifery Council. (2023) Governance. Retrieved from <https://www.nmc.org.uk/about-us/governance/>.
- Equality, UK, n.d. Act 2010, n.d. HMSO, London.
- Webb, L., Clough, J., O'Reilly, D., Wilmott, D., Witham, G., 2017. The utility and impact of information communication technology (ICT) for pre-registration nurse education: A narrative synthesis systematic review. *Nurse Educ. Today* 48, 160–171.
- World Health Organisation. (2024) Deafness and hearing loss. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss#:~:text=Overview,will%20have%20disabling%20hearing%20loss>.
- Yet, A.X.J., Hapuhinne, V., Eu, W., Chong, E.Y., Palanisamy, U.D., 2022. Communication methods between physicians and deaf patients: A scoping review. *Patient Educ. Couns.* 105 (9), 2841–2849. <https://doi.org/10.1016/j.pec.2022.05.001>.