EDUCATION

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**Developing a web-based education program for people with asthma
in rural and remote areas**

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Abstract

Introduction

A needs analysis was conducted to investigate barriers to optimal emergency asthma care in rural Australia. The findings revealed that utilisation of ambulance services for asthma was suboptimal despite improved outcomes in cases where paramedic intervention was sought. Asthma Foundations of Australia funded the development, implementation and evaluation of the 'Ambulances for Asthma' program to address this issue. This paper aims to describe the role the community played in the development and evaluation of the program. The key domains of pedagogy, format, usability, navigation, interactivity and delivery have been utilised to provide a framework for program review.

Methods

A Project Steering Group comprising key stakeholders was convened to establish best practice management of out-of-hospital asthma in rural areas. A multimedia education package incorporating a website, brochure/CD and poster was developed. Human-computer interface testing and focus groups were used to refine the program pre-implementation. Evaluation questionnaires and focus groups were utilised post implementation.

Results

The vast majority (76%) of respondents agreed that the program was user friendly. A large proportion (90.5%) of participants felt more confident with their asthma knowledge and 64% of the participants were more likely to call an ambulance for their asthma as a result of the education package.

Discussion

The use of community based feedback to develop and refine the 'Ambulances for Asthma' program resulted in high levels of user satisfaction. The findings show that the program has potential as a decision aid for people with asthma in rural Australia.

Keywords: community; e learning; evaluation; pedagogy; evaluation.

What this paper adds:

What is already known on the subject?

- The technical aspects of developing and delivering e learning programs is well documented
- The evaluation framework used within this paper has been utilised by reviewers in the past to assess other e learning programs

What does this study add?

- The experience of the community based learner with an e learning education program such as 'Ambulances for Asthma'
- The progression of past research into practice. The development of this intervention was based on two previous research studies.
- The importance of community based feedback to refine health interventions prior to, during and post implementation

Introduction

The 'Ambulances for Asthma' education program was developed as a patient decision aid in response to a needs analysis conducted in 2003 and 2005.¹⁻³ The relevant findings are summarised in Figure 1. Suboptimal utilisation of ambulances by people with asthma living in rural and remote areas was identified. Delay in seeking paramedic assistance and underestimation of asthma severity were highlighted as attitudinal and behavioural issues that were potentially modifiable with education.⁴ This is important as increased ambulance use and earlier intervention has the potential to improve asthma related morbidity and mortality within this population.^{2,3}

Asthma Foundations of Australia, through their Asthma Targeted Intervention Grants funded the development, implementation and evaluation of the 'Ambulances for Asthma' education package to address this issue. The project was trialled in five rural Victorian towns and aimed to educate health professionals and people with asthma regarding when, why and how to call an ambulance for asthma.

A Project Steering Group comprising key stakeholders was convened to establish best practice management of out-of-hospital acute asthma and guide the project. A multimedia education package incorporating a website, brochure with compact disc (CD), web address business cards and poster was developed to convey the information to the community.

The use of decision aids to support decision making is not a new concept.⁵⁻⁹ The literary focus to date has been decision support within the clinical setting rather than the prehospital setting. This program was developed to encourage people with asthma to factor in their rurality when making a decision to access medical care and to recognise when they should utilise ambulance services rather than self transporting to hospital.

Recent systematic reviews support a co-ordinated approach of self-management education, regular medical review and written asthma action plan to achieve optimal health outcomes for people with asthma.^{10,11} The 'Ambulances for Asthma' education program fosters all three components of this approach by providing a multimedia education strategy that offers self management decision support, incorporation of written asthma action plans and prompts early medical review. In addition, the program empowers people to take a proactive role in their asthma management and make emergency management decisions based on evidence based best practice advice.

The program uses an e-learning approach as this is gaining rapid acceptance within rural and remote communities.^{12,13} Web technology is seen as an initiative that increases effectiveness, caters for mass education and reduces cost.¹⁴ Inadequate telecommunications access, computer literacy, and support are a few of the noted disadvantages.¹² Most of the literature on e-learning is content descriptive or focused on tertiary education while the experience of the community based user remains largely under reported.¹⁴

The aim of this paper is to describe the role the community played in the development and evaluation process of the 'Ambulances for Asthma' education program. The key domains of pedagogy, format, usability, navigation, interactivity and delivery have been utilised to provide a framework for program review.¹⁵

Methods

A program logic model using the University of Wisconsin Cooperative Extension logic framework was developed by the project steering group to provide a systematic, visual presentation of the program with its underlying assumptions and theoretical framework as shown in Figure 2.¹⁶ Many of the project stakeholders had limited experience with logic models. This model was deemed by the steering group to provide a framework for program design, implementation and evaluation that was dynamic, comprehensive and easy to understand. One of the major limitations of logic models such as the one utilised in this project is their inability to represent the complexities of causal mechanisms that are inherent within all programs.¹⁷

The project design consisted of a mixed methods approach to ensure a collaborative enquiry and provide more depth and understanding than using a single source of data collection and analysis.^{18,19} Focus groups of local community members with asthma and carers of children with asthma were conducted before and after program implementation. Feedback from the pre-implementation focus groups was incorporated into the package before its release. Feedback from different post-implementation focus groups was used as program evaluation data. The project utilised a process, impact, outcome evaluation approach which is summarised in Figure 2.²⁰ Human-computer interface testing was used to refine the program before its release. An evaluation questionnaire was used to assess the community perspective post implementation.

Ethics approval was received prior to the commencement of data collection. Quantitative data collation was conducted using SPSS,²¹ and qualitative data analysis was assisted by NVIVO.²²

Results

Human-computer interface testing occurred early in the website development to ensure that the design and content was user friendly and appropriate. A purposive sample of three health professional and three community member volunteers with computer skills ranging from basic to advanced were observed to complete a series of set tasks within the website. User interface management software was used, all conversation was noted, website manoeuvrability monitored and recommendations discussed. Guideline documents were not developed due to time restrictions inherent with the project.

A total of eight focus groups consisting of between 4-10 participants were conducted in five different rural Victorian towns, four pre and four post program implementation. Pre-implementation groups assisted in program development and implementation by identifying issues that could impede uptake of the program. These included limited access to resources such as computers/internet, negative past experiences with health professionals and the

complexity of self diagnosis. Post implementation groups provided data for the process, impact and outcome evaluation. This data will be presented in a future paper.

The number of questionnaires distributed post program implementation was 108. Responses were received from 51 participants, resulting in a 47.2% response rate.

Participation was equal amongst the genders, with only slightly more female participants (52%) than male (48%).

Pedagogy

Community based e learning programs must be based on sound pedagogical principles to augment learning.²³ The pedagogical principles underpinning the development of the program were founded within Rusby's revelatory paradigm and based on discovery learning. Discovery learning is supported by learning theorists such as Piaget, Bruner and Dewey and takes place in problem solving situations similar to that required in acute asthma events.²⁴

The program utilized guided discovery learning to promote self direction whilst providing support within the learning environment. Simplified computer simulation to mimic age specific asthma related clinical manifestations of mild, moderate and severe asthma was used.

Format

The education package was specifically formatted to enhance access for marginalised rural users such as the elderly and some indigenous communities by including the following features:

- Audio components to ensure that people with sight impairment or reading difficulties can utilise the material
- Written instructions for the hearing impaired
- Hard copy information via a brochure to support the community that do not have access to a computer
- A credit card type CD to encourage constant portability of the information via a wallet or purse

The media elements incorporated into the program were evaluated for their appropriateness, educational value and effectiveness.¹⁵ Data shown in Tables 1 and 2 indicate that most respondents found the education package to contain clear and relevant information. The use of graphics enhanced interest. Scenarios were incorporated to assist users to assess the current severity of their asthma and prompt them to seek medical assistance early. Pre implementation focus groups were ambivalent about this as this was perceived as a complex process requiring advanced self diagnostic skills. The inclusion of graphics that illustrated what was occurring within the lungs to support age specific respiratory signs and symptoms was suggested by participants to enhance understanding. The user then has to link the two concepts and using guided hypertext, make a decision regarding whether to act or not. This approach emphasizes the learners own initiative²⁵ which is essential in the prehospital setting.

Although more than half of the questionnaire respondents agreed that the scenarios used in the package were similar to real life, some were unsure about the applicability of the scenarios in the 'real-life' rural situation due to the lack of inclusion of socio-economic factors such as geographic isolation, childcare and work commitments.

Dual encoding was utilised to convey information via sight and sound and enhance learning.²⁶ An example of this strategy was the animation with voice-over which was used to describe the pathophysiology of asthma. The effectiveness of this approach was supported by

questionnaire evaluation feedback. Almost half of all respondents (47%) reported that they did not understand what their doctor had told them about their asthma. After viewing the program, the vast majority of respondents (90.5%) were mostly or completely comfortable with their understanding and knowledge about asthma.

Increased health knowledge does not necessarily equate to behavioural change.²⁷ The major outcome sought by researchers was a behavioural change in relation to ambulance useage for asthma. After using the education program, almost two thirds (64%) of the sample reported that they were more likely to call an ambulance for asthma than previously. Whether this intent is actioned is the subject of an ongoing outcome evaluation study.

Usability

The program requires Flash Player to run vital components of the program content. Many community organisations block software downloads which limits the programs usability at an organisational level. Flash player was installed on the CD to remediate this issue. Other usability aspects of program development were strongly influenced by human-computer interface testing. The feedback resulted in language changes, directional aids, greater use of graphics and age specific content. The effectiveness of this strategy was validated in the post implementation questionnaire. The vast majority (76%) agreed that the program was easy to use, with 80% of respondents agreeing that they could access online resources easily and that screen directions were consistent and easy to follow. This was particularly important as the programs usefulness as a decision aid required specific navigation.

Navigation

The program utilises simplified branching rather than linear presentation of material. This flexibility is not possible with printed media and provides learners with enhanced navigational opportunities. A decision tree was provided to assist participants to determine which course of action was required for their particular circumstance. This approach breaks down a complex decision making process into a collection of simpler decisions, thus providing a solution that is often easier to interpret.²⁸ This was the most problematic activity according to feedback from focus groups and human-computer interface testing. Participants initially found the strategy was complicated and confusing and provided suggestions to assist developers to simplify the procedure. The program was redesigned based on these recommendations.

Interactivity

Web program interactivity provides an instructional and pedagogical advantage that supersedes print media.²⁹ Interactivity is a message loop that occurs from the learners perspective and is incomplete until the message loop from and back to the learner has been completed.³⁰ The basic assumption is that interactivity leads to increased learner motivation and enhanced learning outcomes. The learner becomes an active participant in the learning process by dynamically exchanging information within the program.³¹ The cost of this freedom to browse can be disorientation and learner confusion. This was reported by 22% of questionnaire respondents and was associated with poorer learning outcomes.

Delivery

To enhance reach for people with computers but no internet access, the program was made available via a CD. Print medium was available for people with no access to computers. Focus group feedback highlighted the importance of increasing delivery by utilising a multimedia format. This was considered particularly important for remote and indigenous communities where telecommunications access can be below par. Access for older people

with asthma was also highlighted as an issue. This related to computer access and skills and brochure print size.

Discussion

This project developed a multimedia education package for health professionals and their patients in rural Victoria after extensive consultation with key stakeholders. Community members were involved as partners in the process. Their feedback was obtained prior to, during and after implementation of the program and provides the basis for continued refinement.

The ability to engineer advanced education programs has exceeded the understanding of how to deploy them effectively and to adapt them to a range of user populations in complex health settings.³² Therefore, a systematic, continuous evaluation strategy was utilised to increase the likelihood that the conditions of success or indeed failure of the 'Ambulances for Asthma' program were understood.

The key domains of pedagogy, format, usability, navigation, interactivity and delivery provided the framework for program review. The pedagogy underpinning the program was examined and supported in principle by the community according to the evaluation questionnaire. User satisfaction with the program content and quality were evidenced.

Whilst self direction options can be challenging for the inexperienced user, the benefits of incorporating interactivity into the program clearly outweigh the negatives with 78% of users reporting enhanced learning outcomes. Interactivity is a consequence of the learners themselves, the instructional content and activities and the interface between the learner and the program.³³ The later components can be controlled by program designers, however, individual cognitive styles cannot. The use of a help menu has been suggested to assist novice users³⁴ however, individual assistance from health professionals such as asthma educators has been found to be an effective strategy, particularly for older patients.³⁵

Learning styles must be considered when designing, developing and evaluating a program such as 'Ambulances for Asthma'. Scenario based learning was one aspect of the program that was not as well accepted by the participants within this study. This approach has been found to be effective with health professionals,³⁶ however its effectiveness within the community has been the subject of debate. Ward recommends the use of humour to facilitate community acceptance of this learning approach.³⁷ This strategy was not adopted within this program, however remains a consideration for future redesign.

In conclusion, the use of community based feedback to develop and refine the 'Ambulances for Asthma' program resulted in high levels of user satisfaction. The findings show that the program has potential as a decision aid for people with asthma in rural Australia. Further research to determine whether the increased knowledge base evidenced in the post program questionnaire equated to positive behavioural change in the form of increased ambulance utilisation for asthma is recommended.

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Table 1: Asthma Education Package Content

	Strongly Agree (%)	Agree Somewhat(%)	Disagree Somewhat(%)	Strongly Disagree(%)	Unsure (%)
Graphics enhance interest	28 (67%)	10 (24%)	0 (0%)	0 (0%)	2 (5%)*
Content is clear & understandable	22 (53%)	14 (33%)	1 (2%)	0 (0%)	3 (7%)*
Program uses authentic scenarios	14 (33%)	9 (21%)	2 (5%)	0 (0%)	15 (36%)*
Information is accurate	24 (57%)	12 (29%)	0 (0%)	0 (0%)	4 (9%)*
Program maintains interest	26 (62%)	13 (31%)	0 (0%)	0 (0%)	1 (2%)*

*NB: Some respondents did not complete all fields so the sum of responses may be less than 100%

Table 2: Asthma Education Package Presentation

	Strongly Agree (%)	Agree Somewhat(%)	Disagree Somewhat(%)	Strongly Disagree(%)	Unsure (%)
Language & terminology was easily understood	21 (50%)	16 (38%)	3 (7%)	0 (0%)	2 (5%)
Animation assisted explanation	25 (59%)	16 (38%)	0 (0%)	0 (0%)	1 (2%)*
Examples & illustrations were relevant	23 (55%)	15 (36%)	1 (2%)	0 (0%)	1 (2%)*
Presentation is logical & appropriate	19 (45%)	20 (48%)	1 (2%)	0 (0%)	1 (2%)*
Text is clear & easy to understand	13 (31%)	24 (57%)	3 (7%)	0 (0%)	1 (2%)*

*NB: Some respondents did not complete all fields so the sum of responses may be less than 100%

Figure 1: Needs analysis findings addressed within the 'Ambulances for Asthma' program.

Figure 2: 'Ambulances for Asthma' Program Logic Model¹⁶

Figure 3: Program planning and evaluation cycle²⁰