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The Development of Mobile Learning CPD Modules to Improve the Management of Respiratory Diseases

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Abstract: The social and economic cost of Asthma and Chronic Obstructive Pulmonary Disease (COPD) in New Zealand is increasing. In response, new and updated Adult and Child & Adolescent Asthma Guidelines were created by the Asthma and Respiratory Foundation NZ to inform healthcare providers of current best practice. Primary healthcare providers are at the forefront of asthma management and treatment, but the New Zealand population is geographically disparate, and facilitated training can be impractical. Whitireia New Zealand (Whitireia) and The Asthma and Respiratory Foundation NZ worked in collaboration to develop four online interactive modules designed specifically for the primary healthcare sector. Method: The Asthma and Respiratory Foundation and Whitireia established the intended learning outcomes and vision for the packages. New and existing clinical content was reviewed and an outline, storyboard and prototype for four modules was created. All four modules were initially created using Articulate Storyline Two, and later upgraded to Articulate 360 and were accessed via the CPD@Whitireia Moodle Learning Management System (LMS). Modules were piloted and evaluated by regional healthcare providers using Kirkpatrick's Four Levels of Evaluation model, with evaluative data recorded on completion of the modules and at six-week follow-up. Sixteen primary healthcare nurses participated in the pilot and evaluation. There were significant increases in knowledge relating to all learning outcomes for all four modules ($p<0.01$). Respondents reported positive experiences with the content of all four modules, with many aspects gaining a 100% satisfaction rating. Similarly, participants found all aspects of all four modules broadly engaging, with many interactive features gaining a 100% satisfaction rating. On follow up, all participants reported that the modules had provided a substantial positive long-term impact on their asthma and COPD patient care. Evaluative pilot data from the Asthma and COPD modules indicates a very positive response from all participants, in terms of learning, experience and engagement with all four modules. Knowledge aligned to the learning outcomes increased significantly following module completion, with follow-up data illustrating that interactive, well designed eLearning CPD modules can help inform and improve patient care.

Keywords: Mobile learning, Continuing Professional Development, Articulate 360, Respiratory disease.

1. Introduction

Respiratory disease continues to make a substantial contribution to New Zealand's health burden. The recently released Impact of Respiratory Disease in New Zealand: 2016 Update (Telfar & Barnard, 2016), commissioned by the Asthma and Respiratory Foundation NZ, reported that respiratory disease accounted for one in 10 overnight hospitalisations. It also identified that over 521,000 people take medication for asthma, and over 35,000 New Zealanders are estimated to be living with severe Chronic Obstructive Pulmonary Disease (COPD – long-term lung disease). The report also highlighted the growing social and economic disparities among asthma and COPD sufferers, and that primary care healthcare providers were at the forefront of asthma management and treatment. This prompted the development of the Adult and Child & Adolescent Asthma Guidelines, created by the Asthma and

Respiratory Foundation NZ to provide health professionals with current best practice guidance for asthma and COPD management and treatment.

The Asthma and Respiratory Foundation NZ have provided foundational education for health professionals for many years. Changing educational technologies along with these updated clinical guidelines, prompted a review of how this education was delivered. Therefore, to disseminate this clinical information to all healthcare providers, The Asthma and Respiratory Foundation NZ, in collaboration with Whitireia, identified that removing barriers from undertaking professional development would be optimally addressed by the creation of online continuing professional development (CPD) packages. Traditionally, asthma and respiratory CPD courses have been two-day face-to-face workshops, necessitating both travel costs and time away from work, as New Zealand is a geographical diverse location, with many rural communities having limited access to local tertiary education and training. Therefore, in order to upskill the professional workforce within the community, it is essential that quality professional development is available and accessible for all.

The ability for online education to be accessible via any device is becoming increasingly important. Research NZ (2015) found that approximately two-thirds of all adult New Zealanders own or have access to three or more internet enabled devices, with most preferring their smartphone. Similarly, an Australian study in 2014 found that 87% of students had a smartphone (Rung, Warnke, & Mattheos, 2014). A 46% increase in use of smartphones for adult New Zealanders in last three years (Research NZ, 2015), emphasizes the need for tertiary educators to be providing content that is responsive to any device, desktop, tablets and smartphone alike. If designed well, tertiary educators can then create activities that encourage active eLearning by providing learners with engaging interactive resources which require learners to become actively involved in their learning and to reflect on their actions (O'Donnell, Lawless, Sharp & Wade, 2015). This project maximized the strengths of both partners: the clinical education expertise of Whitireia and the research and leadership in the clinical management of asthma and COPD of the Asthma and Respiratory Foundation NZ.

Therefore, in order to evaluate the accessibility and educational value of the four Asthma and COPD modules, a pilot evaluation was undertaken among a target population of primary healthcare nurses who work at the frontline of asthma and COPD management, using the Kirkpatrick Learning and Training theory (Kirkpatrick & Kirkpatrick, 2006). This paper presents the evaluation data from the four eLearning modules.

2. Methods

2.1 Modules Development and Content

The development team, consisting of educators from both The Asthma and Respiratory Foundation and Whitireia, initially met to establish the intended learning outcomes and vision for the packages. New and existing clinical content was reviewed and an outline for four modules was created. From there a storyboard and prototype of the first module was developed and then reviewed by the team. All four modules were initially created using Articulate Storyline two, and later upgraded to Articulate 360 (Articulate, 2017) and were to be accessed via the CPD@Whitireia Moodle Learning Management System (LMS). Rapid authoring tools such as Articulate 360 allow non-programmers such as tertiary educators to take existing course content and create dynamic online educational material (O'Donnell et al, 2015). The modules were not outsourced to specialist eLearning services to be developed, but were instead developed by postgraduate educators with both clinical, educational and eLearning development expertise. The ability to simultaneously 'walk the line' between eLearning developer and academic, enabled the developer to interpret complex clinical content and create engaging interactions and scenarios that were meaningful to health professionals, without repetitive contact. Every stage of development was reviewed in partnership with the subject matter experts (SMEs) from the Asthma and Respiratory Foundation, often remotely using Articulate Review.

Articulate Storyline 360 is also SCORM (Sharable Content Object Reference Model) compliant, enabling tracking of participant's progress and completion results on LMS. Storyline 360 allows developers to create content that is made more engaging by including dial and slider interactions, video and audio interactions, quizzes, hotspots, variables and branching scenarios. Most importantly

Storyline 360, allows developers to create responsive course content that can be viewed anytime, at any place and on any device. Accessibility to education was deemed critical in the creation of these courses.

The result was the creation of four interactive and self-paced modules that enabled participants to demonstrate new knowledge and apply learning. The modules were designed to be completed within eight to twelve hours in the following order: Asthma Fundamentals, Asthma Management, COPD Management, and Health Promoting Practice. Each module addresses three learning outcomes and were designed for healthcare professionals in all settings. Modules were reviewed by Health Literacy New Zealand to ensure clarity, along with clinical experts to check that the adaptation of the new guidelines were accurate. On completion, the modules were reviewed and tested internally and then externally to address technical issues, content and relevance to practice.

2.2 Evaluation

The evaluation was based on Kirkpatrick's Four Levels of Evaluation model (Kirkpatrick & Kirkpatrick, 2006), which proposes a four level training evaluation approach. The first two levels, Reaction and Learning can be assessed on completion of the course, and include both the participants perceptions of the training and their perceived increase in knowledge. Level Three explores the extent to which the new learning has been applied on the job, and requires post-participation follow-up. Level Four evaluates the organizational impact of the training (for example, improvements in patient outcomes), which fell outside the remit of this investigation.

2.2.1 Participants and Procedures

Participants were recruited from a cohort of primary health care nurses working in a geographically rural area of the lower North Island, New Zealand. The nurses were approached to participate in the evaluation by email, which outlined the background of the module development along with the course content. Potential participants were informed that they would be required to undertake all four modules within a six week period and provide feedback using an online questionnaire on completion of each module. Questionnaires were an adapted version of the Whitireia Faculty of Health standard programme evaluation tool, and were piloted internally to ensure clarity and practicality. Changes in understanding based on the learning outcomes were charted on a seven-point numeric Likert scale. Participants were also asked to rate their experiences of undertaking the modules using a four point Likert scale, from 'Strongly disagree' to 'Strongly agree', and to rate their engagement with the modules using a five point Likert scale, from 'Not at all engaging' to 'Very engaging'. Additional questions were designed to explore mobile device type, internet connectivity, web browser platform and performance issues. A follow-up online evaluation questionnaire was sent to all participants six weeks following completion of the four modules, with seven statements related to learning outcomes and practice rated on a seven-point numeric Likert scale ('Very much/often' to 'Not at all / rarely'). Questionnaires presented on completion of the modules were designed to incorporate Kirkpatrick Levels One and Two, and the follow-up questionnaire reflected Level Three of the Kirkpatrick model.

2.2.2 Statistics

The data were analysed using SPSS. Statistical significance level was set at $p<0.05$. The study was performed as a within-subjects design, using descriptive statistics and Paired T-Tests with means to find direction. Data are expressed as mean ± standard deviation.

3. Results

3.1.1 Participants

Sixteen primary healthcare professionals agreed to participate in the pilot evaluation. The study population was comprised of 11 (69%) practice/district nurses, three (19%) specialty nurses and two

(12%) nurse educators. Participants had been in their current clinical role for an average of 8.2 (± 6.9) years. Participants reported that each module took an average of 118 (± 54) minutes to complete. Fifty six percent of the cohort completed the modules by laptop, 37% by PC and 7% by tablet.

3.1.2 Module Learning Outcomes

Participants reported a significant improvement in their understanding aligned with the learning outcomes for all four modules on completion of the eLearning packages. Module One learning outcomes; prevalence and causes of asthma in New Zealand (4.75 ± 0.85 vs. 6.37 ± 0.05, $p<0.001$), anatomy and physiology of respiratory system (5.43 ± 1.03 vs. 6.50 ± 0.51, $p<0.001$) and diagnostic tools (5.12 ± 0.95 vs. 6.31 ± 0.71, $p<0.001$) showed significant improvements in knowledge following module completion, while Module Two learning outcomes; approaches to asthma management (4.43 ± 1.26 vs. 5.93 ± 0.92, $p<0.001$), creating an asthma self-management plan (4.31 ± 1.25 vs. 6.06 ± 0.68, $p<0.001$) and asthma medication 4.25 ± 1.23 vs. 5.93 ± 0.68, $p<0.001$) showed similar gains. Module Three learning outcomes; risk factors and incidence of COPD (4.93 ± 1.03 vs. 6.33 ± 0.72, $p<0.001$), signs and symptoms of COPD (5.20 ± 1.14 vs. 6.53 ± 0.63, $p<0.001$) and COPD management options (4.86 ± 1.35 vs. 6.40 ± 0.82, $p<0.001$) had comparable improvements to the Module Four learning outcomes; social determinates of respiratory health (5.21 ± 0.97 vs. 6.64 ± 0.49, $p<0.001$), health literacy (5.21 ± 1.05 vs. 6.64 ± 0.63, $p<0.001$) and culturally responsive care (5.71 ± 0.99 vs. 6.57 ± 0.64, $p=0.001$).

3.1.3 Experience

Participants were asked to rate their experiences of undertaking the modules using a four point response scale, from 'Strongly disagree' to 'Strongly agree'. The table below (Table One) indicates the percentage of respondents who responded positively towards the modules.

Table One: Percentage of respondents indicating they either 'agreed' or 'strongly agreed' with statements relating to their experience of each module.

	Module One	**Module Two**	**Module Three**	**Module Four**
I found the module was engaging	100%	100%	93%	86%
I thought the content was presented clearly	100%	100%	93%	100%
The module content was relevant to my job	100%	100%	100%	100%
Completing the module has improved my understanding of asthma care	100%	100%	87%	100%
I am confident that I can apply this learning to my job	93%	100%	100%	100%
I was comfortable with how long the module took to complete	93%	93%	100%	100%
I found the module easy to navigate	93%	100%	100%	79%

3.1.4 Engagement

Participants were asked to rate how engaging they felt each interaction type was using a five point Likert response scale, from 'Not at all engaging' to 'Very engaging'. The table below (Table Two) indicates the percentage of respondents who responded positively towards each module.

3.1.5 Follow-up

At six week follow-up, participants rated seven statements related to learning outcomes and practice on a seven-point numeric Likert scale ('Very much/often' to 'Not at all / rarely'). All participants reported

that the modules had provided a substantial positive long-term impact that informed their asthma and COPD patient care. Responses indicated improvements in all targeted learning outcomes in relation to their practice (see Figure One).

Table Two: Percentage of respondents indicating they found the modules interactions either 'quite engaging', 'relatively engaging' or 'very engaging', with parentheses representing the percentage of respondents indicating the two highest scores.

	Module One	Module Two	Module Three	Module Four
Drag and drop	100(57)%	100(67)%	93(27)%	100(57)%
Click and reveal	93(32)%	100(57)%	93(54)%	100(57)%
Scenario	100(49)%	100(57)%	100(60)%	93(36)%
Dials and sliders	81(50)%	93(63)%	72(40)%	72(36)%
Mix and match	93(38)%	100(50)%	100(60)%	100(65)%
Reflective questions	87(38)%	100(50)%	100(74)%	87(65)%
Video	70(50)%	81(50)%	72(54)%	100(50)%

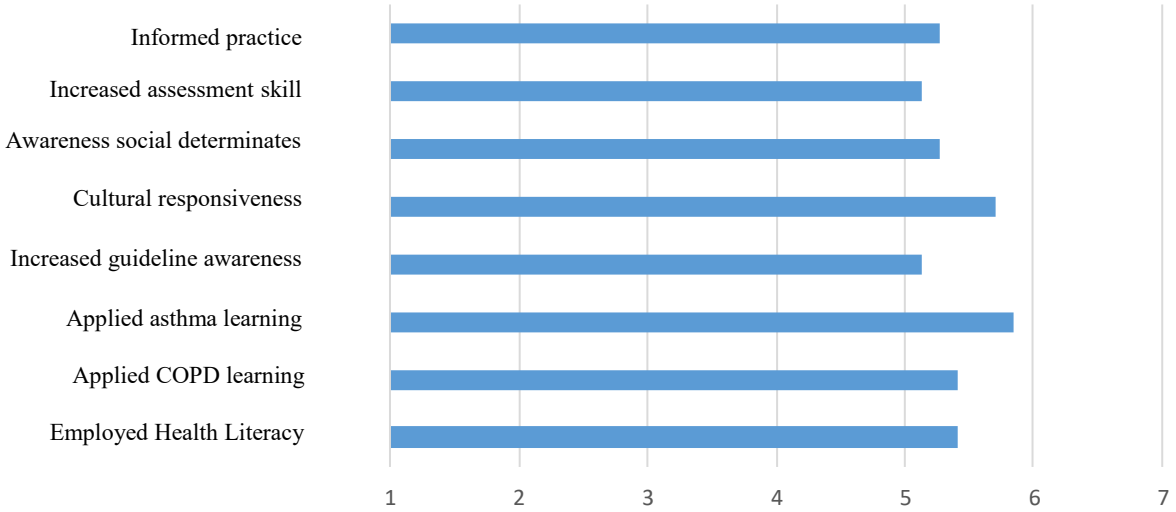

Figure One: Mean responses to the impact of undertaking the asthma modules on practice.

4. Discussion

The pilot evaluation data from the four Asthma and COPD modules created by The Asthma and Respiratory Foundation NZ in collaboration with Whitireia New Zealand indicates a very positive response from all participants in terms of both learning, experience and engagement. Analysis of the participants' knowledge measured against the learning outcomes following completion of the modules showed significant gains in comparison with their own reported pre-module understanding. Follow-up data also indicated that undertaking the modules had an appreciable positive long-term impact on their clinical practice, informing and improving their approaches to patient care.

The modules were completed on a number of electronic devices with few technical complications. However, the results relating to engagement with video may be associated with reported web-based connectivity issues. Participants found the interactive interface of the modules highly engaging, with 'drag and drop', 'click and reveal' and scenario based questions gaining almost unanimous satisfaction.

This pilot evaluation has demonstrated that complex healthcare teaching can be provided through an online eLearning CPD platform. Hernam and Mustea (2016) believe that interactive eLearning material helps articulate important course content and encourages reflection and integration of the new information. Most importantly interactive material is thought to help learners remember core concepts as content is presented in a number of ways to suit varied learning styles. This places the

learner in the centre of the experience (Bergmann & Sams, 2012), while the online modules can be completed 'anytime - anywhere – any pace' on any mobile device. Participants can therefore review or revisit content as often as they want to consolidate knowledge.

The vision promoted in the New Zealand Health Strategy is for all New Zealanders to 'Keep well - stay well - get well' (Minister of Health, 2016). Nurses and health professionals are the front line promoting optimal respiratory health for everyone, supporting people who live with the long-term conditions of asthma and COPD to live and stay well, and preventing serious problems that lead to loss of enjoyment of life and hospitalisations. It is crucial for health professionals to have access to current, accessible, research-based professional development that is fit for purpose. This successful partnership between Whitireia and the Asthma and Respiratory Foundation NZ produced an innovative online continuing professional development course, extending the boundaries of traditional teaching for complex clinical skills. Early evaluation indicates that the modules are relevant, useful and already impacting the knowledge and skills of those who support people who live with asthma and COPD.

5. Conclusion

eLearning modules offer tertiary educators a way to provide engaging, interactive and comprehensive CPD education, with the flexibility required to suit busy healthcare professionals. There are a number of challenges, including the invested time required to master the authoring tools, but the rewards are rich and the potential to improve learner engagement without geographic limitations are extraordinary.

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