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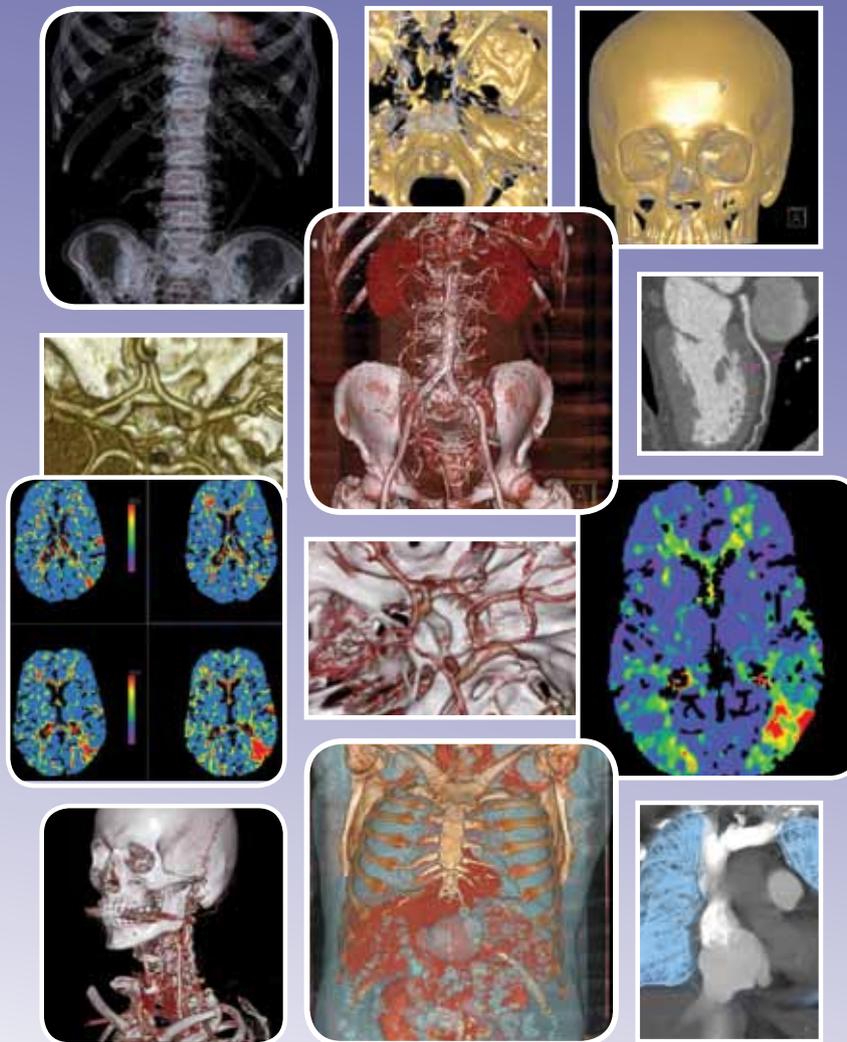
Equity into Early Detection of Breast Cancer Education via Interprofessional E-learning

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ABSTRACT

Background: Interprofessional education (IPE) is central when competences needed in managing complex patient service chains, like the diagnostic process of breast cancer is being taught.

The purpose of this study was to evaluate the e-learning modules related to early detection of breast cancer produced in earlier phases of the project for biomedical laboratory scientists, midwifes, nurses, public health nurses and radiographers.

Methods: An evidence-based developmental method was applied for the preparation of modules on early detection of breast cancer for health care professionals (the EBreast project). The learning modules were evaluated by the relevance of the content, technical quality and achievement of learning outcomes by health care students and professionals in the five European countries (totalling 176 evaluations). Also, usefulness of the modules was evaluated by 13/21 health care staff members and lecturers participating in the intensive course related to the implementation of project outcomes.

Results: The students and health care professionals in the countries participating in the EBreast project evaluated the materials related to the interprofessional way of working and radiation safety as most relevant, and the technical quality as good. As for achieving the learning outcomes, basic issues related to the breast cancer diagnostic process were learned the best. The participants of the project related to the intensive course perceived this course as useful or very useful. They thought that they can use the materials either module by module, or as a whole course in CPD or as a part of basic degree education for all the professional groups it is intended for.

Conclusions: Although e-learning is not the best way for acquiring interprofessional skills or practical competences, nevertheless, this is a suitable way to offer education about the diagnostic process of breast cancer to a wider audience across the world, harmonizing health care education and clinical processes. From the clinical practice point of view e-learning is a suitable way of orientating new beginners in mammography into breast cancer diagnostics and the process in all. In larger educational development projects multiphase evaluation methods like the ones used in this project are recommendable to use.

Keywords: breast cancer, diagnostic process, evaluation, e-learning, interprofessional education

BACKGROUND

Mammography has nowadays established its position as a natural part of women's lives, latest after the age of 50, especially in Europe, and also in Western countries in general (Chen et al. 2017). Breast cancer diagnostics, comprising mammography and other both radiographic and biomedical laboratory diagnostic examinations, form a complex process involving various health care professionals. Development of diagnostic techniques, hospital information and patient data management systems pose also challenges to the health care staff. There is a constant need for updating the competences of the health care and medical professionals in these areas. Radiographers working in mammography have training needs related to interpersonal

and psychosocial skills, quality control, interventional procedures and breast dose optimisation (Whelan et al. 2017, Sá dos Reis 2017). In reports evaluating the breast screening process the following aspects have been highlighted: lack of knowledge of the breast screening process among the health care staff, some lack of breast imaging competence among radiographers, and insufficient quality of the screening process (EUREF 2006).

Clinicians and health care staff can manage care, diagnostic processes and exercise teamwork once they have a common goal and understand who, when, where, and how team members need to coordinate their actions and communicate in an accurate and timely fashion. Interprofessional education (IPE) in healthcare is being considered as a key factor in providing a patient-centred, responsive and high-quality care (Guraya et al. 2018). Focusing on the patient and the overall process of care, coordination can help move groups toward becoming teams who deliver a better care by identifying and managing goals, roles, and interdependent care tasks (Taplin et al. 2015). IPE is central when competences needed in managing complex patient service chains like the diagnostic process of breast cancer is being taught. Early detection of breast pathology demands a variety of imaging modalities to ensure the best outcomes. This has also an impact on the theoretical and practical education and training of health care staff. Several benefits of IPE have been reported such as improved teamwork and collaboration (Dabaghzadeh et al. 2017), effectiveness of education (Guraya et al. 2018), and provision of patient-centred, responsive and high-quality health care services (Ateah et al. 2011). All these issues are central in teaching the interprofessional way of working in relation to the diagnostic process of breast cancer.

Developing e-learning modules

In the project described in this article we combined open access e-learning with IPE while constructing an e-learning package on the diagnostic process of breast cancer. According to Holmström and Ahonen (2016) interprofessional learning and e-learning are the most used learning methods and also perceived as positive for theoretical studies and clinical training. The reason for selecting e-learning was the idea of bringing equity into teaching a topic where there is a common need for education in the whole Europe and even in the whole world. The creators of this educational package are totally aware that hands-on skills like patient positioning or handling biomedical laboratory samples in a correct way cannot be acquired just by watching a video or reading materials on the e-learning platform. However, theoretical knowledge is the base of developing skills and competences. E-learning can be combined with face-to-face learning to develop these skills. This is called blended learning which has proven to have many benefits in health care education (Metsälä et al. 2017). Open access format of e-learning makes the learning materials available to all health care professionals (biomedical laboratory scientists, midwives, nurses, public health nurses and radiographers) and students, regardless of place or time. This is also a way of standardizing health care practices, which is a core thing when we speak about the quality of services (Douglas et al 2008). The relationship between e-learning, interprofessional and evidence-based (EB) learning can be described so that e-learning acts as a kind of technical means of learning, interprofessional and EB-learning instead refer to the students' way and source of constructing their knowledge.

An evidence-based developmental method (Metsälä et al. 2012, Grönroos et al. 2010) was applied for education and training in early detection of breast cancer for health care professionals (the EBreast project). The results of the previous studies have been reported in the referred articles (Metsälä et al. 2017, Strøm et al. 2018, Sá dos Reis et al. 2019). The three e-learning modules were developed based on the research results, expert opinions and potential user feedback. The modules comprise the learning outcomes, learning materials, reflection questions and quizzes that support the development of core competences. The open access e-learning package constructed for teaching the diagnostic process of breast cancer to health care professionals and students comprises three modules which the learner either can study all or just focus on the most interesting ones for him/herself.

The purpose of this study was to evaluate e-learning modules related to early detection of breast cancer produced in earlier phases of the project.

METHODS

Contents of e-learning modules

The first module focuses on interprofessional working in early detection of breast cancer, comprising e-learning materials related to basics of breast cancer epidemiology, aetiology and the diagnostic process. It also covers the roles of different health care professionals, patient communication and psychosocial aspects of the diagnostic phase of breast cancer as well as breast cancer awareness. The second module focuses on patient care during the mammography procedure, radiation safety, the design, physics and function of mammography device, its impact on radiographer practice and ergonomic working as well as quality assurance, quality control and clinical image quality, including potential artefacts. The third learning module consists of further radiographic imaging modalities and biomedical laboratory examinations for breast cancer. This includes topics such as the physics and function of equipment, technological principles, patient awareness and safety, the use of contrast media, biopsies, preanalytical factors in sample collection, immunohistochemical markers and blood tests. The learning materials produced on Weebly platform comprise videos, texts, animations, PowerPoint and Prezi presentations, and quizzes for self-assessment to identify the achievement of learning outcomes.

Evaluating e-learning modules

E-learning modules were evaluated in two phases: 1) student and health care staff evaluation of the content relevance and quality, and 2) usefulness evaluation performed by participants of the intensive course conducted in the project. In addition, the operational project group and the project steering group did internal evaluation all the time during project process. After student and health care staff evaluation the modules were revised according to suggestions given.

STUDENT AND HEALTH CARE STAFF EVALUATION 1

The e-learning modules were evaluated by the relevance of the content, technical quality and achievement of learning outcomes by health care students and professionals (biomedical laboratory scientists, nurses and radiographers) in five European countries participating in the EBreast-project. By this way we could take into account both expert opinions and user views which is a basic principle of evidence-based practice. The modules were evaluated in part for practical reasons since they were completed by different dates. The ones being responsible for the project in every country selected students and health care staff members taking part in these evaluation surveys. This is how the module content could be targeted to groups who had proper background knowledge to be able to understand and evaluate the modules. Each learning module was evaluated with a different e-form, taking into account the special features of that particular module like learning outcomes, and the number and type (PowerPoint presentation, video, Prezi-presentation) of learning materials constructed. However, there were also general features of learning modules such as technical quality and time spent on passing the module which were evaluated on behalf of every module. Free word comments about the pros and cons of the learning materials were also asked. Based on these evaluations the materials were reviewed and revised.

INTENSIVE COURSE PARTICIPANT EVALUATION 2

In order to implement this kind of e-learning package, some education is needed. This is why the project group organised an intensive course comprising topics related to the evidence-based method, e-learning pedagogy, evaluation, basics of interprofessional teaching and learning. The course also introduced the participants the content and use of the platform. Feedback on the course was acquired during the course by using simple Google Forms enquiry with open-ended questions.

Evaluation instruments

STUDENT AND HEALTH CARE STAFF EVALUATION 1

Relevance of the learning material to the achievement of the learning outcomes was evaluated with the equal number of learning materials present in each learning module (module 1 n=13, module 2 n=18, module 3 n=26). The statements were answered using a six-point Likert scale (highly relevant=5 to highly irrelevant=1), the sixth response option being N/A. The scale about the technical quality of the learning material comprised ten statements. These statements were also answered by using the six-point Likert scale with response options ranging from "very good" to "very poor". In addition to these six response options, one more option was given, indicating that the evaluator had not reviewed that specific material. Achieving the learning outcomes of the modules was enquired with the equal number of learning outcomes present in each learning module (module 1 n=7, module 2 n=5, module 3 n=12), comprising statements with five response options ranging from "very well" to "not at all", and in addition with response option N/A. Means of the items were calculated. Also summarized variables of each scale for each module were calculated and their means reported.

There was also an open-ended question where the evaluator was asked to specify her/his answer in case she/he had responded with the two most negative options of each statement and scale.

In addition, there were three open-ended questions about the time spent studying the e-learning module, pros and cons of the learning material. These were analysed simply by grouping the repeated themes that were included in the answers.

INTENSIVE COURSE PARTICIPANT EVALUATION 2

Intensive course participants were asked open-ended questions about the usefulness and potential implementation ways of the materials in their institution. They were also asked a general question 'Please mention the most important things you learned during the intensive week?' Answers to open-ended questions were analysed by grouping the repeated themes involved in the answers.

RESULTS

Interprofessional e-learning package

STUDENT AND HEALTH CARE STAFF EVALUATION 1

In total, 176 persons participated in the evaluation of the e-learning package: the first e-learning module was evaluated by 72 biomedical laboratory scientists, nurses, radiographers and students; the second module by 21, and the third module by 83 participants.

The relevance was evaluated the highest in module 1 comprising the issues related to the interprofessional way of working in the mammography diagnostic service chain. Learning materials dealing with the client pathway and health care professionals working in the breast cancer diagnostic chain (4.69) were evaluated as the most relevant ones in module 1. Midwives' role in early breast cancer detection in Estonia was evaluated as the least relevant (3.44) material in this module. In module 2, the material related to radiation safety in mammography (4.55) was evaluated as the most relevant one and physics and equipment (3.90) as the least relevant one. In module 3, the radiographer's role in breast MRI (4.58) and digital breast tomosynthesis (3.33) as the least rele-

vant material. (Table 1)

Technical quality of learning modules was evaluated highest in module 3 dealing with further examinations of mammography. In module 1, the highest rated technical feature was the quality of images (4.69) and the lowest the quality of audio recordings (3.40). In module 2 the highest was evaluated understandability of text (3.95) and the lowest the level of interactivity (3.16). In technical sense of module 3, the highest was rated the quality of images (4.65) and the lowest the level of interactivity (3.73). (Table 1)

Regarding the achievement of learning outcomes module 3 was rated the highest. In module 1, the best achieved learning outcome was the following one: 'The learner should be able to demonstrate advanced knowledge involving critical understanding of theory and principles of client counselling to promote breast cancer awareness, informed choice, positive breast imaging attitudes/experiences and to promote attendance at breast examinations' (4.42). The least achieved learning outcome of module 1 was related to the breast cancer process, differentiating the meaning of global, national and local viewpoints (4.02). The best achieved learning outcome of module 2 was 'Critical understanding of theory and principles of mammographic image quality related to positioning, compression and technical parameters' (4.35), and the least was achieved the importance of quality assurance tests all over the mammography chain (4.06). The best achieved learning outcome of module 3 was related to the radiographer`s role in breast imaging examinations' (4.89) and the least achieved outcome was related to recognizing anatomical structures, physiological processes and specific signs of pathology (4.0). (Table 1)

In the open-ended questions, the following issues were most frequently repeated: The technical variability of the learning materials was considered as important. Also, clear language and understandable contents was perceived as important since not all the users are native English speakers. What would have been wished for more, was the interactivity of the course platform. The respondents wished to avoid long texts in the materials and there were suggestions related to the functionality of the platform.

INTENSIVE COURSE PARTICIPANT EVALUATION 2

The participants of the project related to the intensive course (13 answers out of 21 participants) indicated in their open-ended responses that they perceived this course as useful (n=6) or very useful (n=7) for their own practice. They thought that they can use the materials either module by module or as a whole course in CPD or as a part of basic degree education for all the professional groups it is intended for. Some parts (e.g. module 3) can also be used at Master level since they are more demanding. They thought they can implement the course via their national professional societies, via internet pages of their institutions and professional societies, via talking about it to their colleagues, in health care professional events and via social media.

The most important things the participants reported learning during the intensive course were: understanding the meaning of planning and the strategy of e-learning courses (5/13), meaning of pedagogic script (4/13), and the importance of interprofessional way of working and teaching (9/13). Plans were made how to integrate the EBreast e-learning modules nationally and locally into the teaching of breast cancer detection in an interprofessional way.

DISCUSSION

The evaluation results of the relevance of the learning materials confirmed the results of the studies that were conducted to collect evidence for the basis of creating this open access e-learning package. The results showed an obvious need for materials related to an interprofessional way of working in the breast cancer diagnostic chain. Also, knowledge about radiation safety and performing mammography examination is highly needed. Although e-learning is not the best way for acquiring interprofessional skills or practical competences, nevertheless, this is a suitable way to offer education about the diagnostic process of breast cancer to a wider audience across the world, equalizing health care education and clinical processes. According to the European guidelines for quality assurance in breast cancer screening and diagnosis (EUREF 2006), a

Table 1. Results of student and staff evaluation (means).

Scales 1 to 5	Module 1 (n=72)	Module 2 (n=21)	Module 3 (n=83)	Mean Mod 1-3
Relevance of the learning material summated variables	4,24	4,22	4,09	4,18
Highest item score	4,69	4,55	4,58	
Lowest item score	3,44	3,90	3,33	
Technical quality of the learning material summated variables	4,02	3,79	4,27	4,03
Highest item score	4,31	3,96	4,65	
Lowest item score	3,40	3,16	3,73	
Achieving learning outcomes summated variables	4,24	4,23	4,42	4,30
Highest item score	4,42	4,35	4,89	
Lowest item score	4,03	4,05	4,00	

breast unit must have a core team composed of health professionals of various disciplines who have undergone specialist training in breast cancer beyond that given in their general training (EUREF 2006). This emphasizes the importance of training in interprofessional cooperation amongst all the health care staff being involved in the diagnostic process of breast cancer. An interprofessional way of working can be learned the best when it is practised already during the studies. In order to act optimally in the best interests of the patient each health care professional needs to know the roles and responsibilities of all health professionals involved in the breast cancer diagnostic chain. By that means they can provide optimal care and services without unnecessary delays or mistakes. Knowing the whole diagnostic chain, the staff involved are able to give optimal patient guidance and counselling.

Evaluating the technical quality of e-learning package the strengths were technical quality of images and understandability of the text. Issues that got the lowest evaluations were the level of interactivity and the quality of audio recordings. The creators of this e-learning package were mostly professional teachers who are accustomed to write easy to understand texts for students, following the principles of pedagogics. This seemed to be absolute benefit in creating these materials. However, in the future creating this kind of materials, levels of interactivity is something to seriously to consider about.

Evaluation results about achieving the learning outcomes showed that in this e-learning package the best learned course contents was related to basic issues of breast cancer detection like client counselling, optimal performance of breast imaging and the radiographer's role in the process. From the clinical practice point of view e-learning is a suitable way of orientating new beginners in mammography into breast cancer diagnostics and the process in all. This e-learning course offers a possibility to compare practices in one's own country to those of other countries as well as a pos-

sibility to learn what other health care professions are doing in the breast cancer diagnostic chain and by that means to expand one's understanding about other profession's work and competency.

Limitations: The educational intervention conducted within this project followed the evidence-based developmental method, which simply follows the process of finding out the core of product, concept or action model based on research evidence, expert opinions and client or user experience (Metsälä et al. 2010, Grönroos et al. 2012). There were some challenges related to specific research studies performed, e.g. a limited number of countries and respondents involved in the surveys performed (Sá dos Reis et al. 2019), the fact that the English language was not the native language for those being interviewed in focus group interviews (Strom et al. 2018), and some technical issues related to the data collection and processing. In addition, at the beginning of the development work there was insufficient knowledge about IPE but in the course of the project, also a wider understanding about this issue was gained by the project group.

The evidence-based method as such seemed to fit quite well into this project though there were some challenges related to the time-consuming research and reporting processes of the results. These problems were solved to a certain extent by firstly producing concise main results of the integrative reviews and surveys to form a basis of the development work. After that, intact reports like articles about the results were written. Based on the experience of this project, the use of this method by researchers and developers can be recommended for educational interventions in future.

It would have been best if the whole e-learning package could have been evaluated several times as an entity. Due to practical reasons related to the project timeframe, it was mostly evaluated module by module by health care students and staff in all five countries participating in the project. However, during the intensive course at the end of the project the participants could evaluate

the whole e-learning package.

CONCLUSIONS

Teaching multifaceted health care processes like the diagnostic process of breast cancer interprofessional education is the way of ensuring client centred high quality services to the patient. An evidence-based method of constructing this kind of educational entities seems to fit well for this kind of purposes. The main benefit of open access e-learning is that the material can be reached, regardless of time and place, which brings equity to education and by that means standardizes health care practices. In a large scale development project this kind of multiphase evaluation method is necessary in order to evaluate both the process and outcomes of the project from several stakeholders' viewpoint: users – health care students and staff), teachers and other stakeholders.

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