Learner’s satisfaction within a breast imaging eLearning course for radiographers

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Summary

1. Breast cancer & eLearning

2. An eLearning course on breast imaging for radiographers

3. Experimental study for the course evaluation

4. Impact results focusing on learners’ satisfaction

5. Discussion and conclusions
1. Breast cancer & eLearning
Breast cancer

- Breast cancer
  - 2008: the most common cause of cancer-related death in women worldwide\(^1\)
  - Europe: one in every 10 women will develop the disease\(^2\)
  - Portugal: 1500 women die every year\(^3\)

- Mammography\(^4\)
  - Screening
  - Diagnosis
  - Intervention

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1 – Boyle, 2008
2 – Jemal, Global Cancer Statistics, 2001
3 – Liga Portuguesa contra o cancro, 2009
Radiographer

- The **radiographer** has a key role in the performance of mammography\(^1\)

- Education and training programmes are crucial to **improve** the radiographer’s professional **knowledge, skills and behaviour**\(^1\)

- **ELearning** must be considered as a relevant continuing education tool\(^2\)

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2 - Ruiz J, J Assoc Amer Med Colleges, 2006
Elearning

• Advantages:
  • Asynchronous ability
  • Cost-savings
  • Personalised learning
  • Increase of accessibility
  • Ease of distribution
  • Ease of update content

• Software used:
  • Wiki, websites
  • Fóruns, blogs
  • Learning Management Systems (LMS) – Moodle
ELearning needs to be justified by its effectiveness and relevance

User’s satisfaction and knowledge

Most study designs used:
- Non randomised
- With and without control

Randomised controlled trials are strongly recommended to evaluate eLearning systems in order to get more strong evidence\(^1\),\(^2\)

\(^1\) – Chumley-Jones et al., A Amer Med College, 2002;
Evaluation tools

- **Pre and post-knowledge tests**

- **Satisfaction questionnaires**
  - Wang, 2003¹: a complete domain for the eLearner satisfaction measurement¹
  - Seven-point Likert scale
  - 26 items: content, interface and navigation, personalization, learning community
    - The last two questions: overall satisfaction and success
  - Reliability (Cronbach alpha) of 0.95

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¹ – Wang, Information & Management, 2003
Aim

• Assess the learners’ satisfaction within an eLearning course on breast imaging for radiographers.
2. An eLearning course on breast imaging for radiographers
E-Learning course

- Portuguese language
- Developed using HTML, JavaScript and PHP
- Hosted on the server of Faculty of Medicine of University of Porto
- Asynchronous
  - 20 days period available through an individual login
- Contents reviewed by specialists from Centro Hospitalar S. João, Porto (CHSJ)
  - Text, images, videos, Prezy® presentations, tables with main key-points, formative tests
  - Clinical and radiological images were collected directly from the Breast Centre at CHSJ
ELearning course

• Contents

• Based on Guidelines on the standards for the training of specialised health professionals dealing with breast cancer, EUSOMA¹, 2007

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Breast anatomy and physiology of breast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 2</td>
<td>Breast cancer: multidisciplinary approach</td>
</tr>
<tr>
<td>Module 3</td>
<td>Breast pathology</td>
</tr>
<tr>
<td>Module 4</td>
<td>Mammography: technical approach</td>
</tr>
</tbody>
</table>

¹ – European Society of Breast Cancer Specialists
ELearning course

Senologia para Técnicos de Radiologia
Curso eLearning

Login

Utilizador: [Input field]
Password: [Input field]

Enviar

Inês C. Moreira, 2012 | Mestrado em Informática Médica | Faculdade de Medicina / Faculdade de Ciências / Universidade do Porto
Bem-vindo(a) Guest!

Define-se por **Senologia** a ciência multidisciplinar no estudo da patologia mamária.

Este curso visa promover conhecimento aos técnicos de radiologia e alunos de licenciatura em Radiologia sobre inúmeros aspectos relacionados com a patologia mamária, e o desenvolvimento de competências para a execução, leitura e interpretação de mamografias.

Encontra-se dividido em quatro módulos:
- Módulo 1 – Anatomia e fisiologia da mama;
- Módulo 2 – Abordagem multidisciplinar do cancro da mama;
- Módulo 3 – Patologia da mama;
- Módulo 4 – Mamografia: abordagem técnica.

Para uma melhor abordagem do curso, aconselhamos a consulta da página das **instruções**.
Módulo 4 Mamografia: Abordagem Técnica

Perfil Histórico

A apresentação que se segue indica os principais marcos históricos da evolução da Mamografia, e sua importância para o rastreio do câncer da mama.

Para ver a apresentação em fullscreen, após clicar na seta pode clicar em "More" e selecionar "Fullscreen".

Mamografia: Perspectiva histórica
Módulo 4 Mamografia: Abordagem Técnica

Pontos-Chave

- A Compressão é de extrema importância pois permite diminuir a espessura da mama, homogeneizar os tecidos e colocar as estruturas da mama o mais próximo possível do receptor, diminuir a radiação disperda produzida, reduzir a dose absorvida pela mama, reduzir o fluxo cinético e reduzir o fluxo geométrico;

- O sistema AEC encontra-se por baixo do receptor e controla a atribuição de milíamperagem (mAs), de acordo com os kV atribuídos, assim como a peça do ánodo e o tipo de filtro mais adequado para a mama em questão;

- Dose Glandular Média: atualmente é de cerca de 1 a 2 mGy por incidência;

- Proteção radiológica: reação lateral da cabeça da paciente, fornecer colar da tireóide a ventral de chumbo sempre que solicitado, equipamento com filtros, grelha anti-difusora e uma ampolha com uma angulação de 10° a 20° - o feixe primário de radiação tangente à parede torácica (efeito anódico);

- O Técnico de Radiologia assume um papel fundamental na execução da mamografia com o principal objetivo de...
Módulo 4 Mamografia: Abordagem Técnica

**Teste**

1. Segundo a legislação portuguesa, a força máxima de compressão aplicada na mama deverá ser:
   - a) Entre 20 a 30 Kg;
   - b) Entre 5 a 12 Kg;
   - c) Entre 13 a 20 Kg;
   - d) Entre 2 a 9 Kg;
   - e) Não sabe / Não responde.

2. Que fator é determinante no espectro do raio-X em mamografia?
   - a) O material do ánodo da ampola;
   - b) A força de compressão;
   - c) O tipo de aquisição de imagem;
   - d) A proteção radiológica;
   - e) Não sabe / Não responde.
Módulo 4 Mamografia: Abordagem Técnica

Teste

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   - b) Entre 5 a 12 Kg;
   - c) Entre 13 a 20 Kg;
   - d) Entre 2 a 9 Kg;
   - e) Não sabe / Não responde.

✓ Correcto

2. Que fator é determinante no espectro do raio-X em mamografia?
   - a) O material do ánodo da ampola;
   - b) A força de compressão;
   - c) O tipo de aquisição de imagem;
   - d) A proteção radiológica;
   - e) Não sabe / Não responde.

👤 Não respondeu. Resposta certa: a
Experimental study for the course evaluation
Stratified controlled randomised trial

Stratified sample

- Radiography students
  - Already had mammography clinical training
- Radiographers
  - Public health institutions in Porto’s metropolitan area

Intervention and control groups

- Intervention: perform the eLearning course
- Control: do not perform the eLearning course

Outcomes

- Evolution in knowledge (pre and post-tests; efficacy)
- Learners’ satisfaction
Satisfaction questionnaire

- Wang, 2003
- Translated to Portuguese by an expert translator
- Additional questions:
  - eLearning experience
  - Health related eLearning experience
  - Open-answer question for comments
- Demographic data was collected at the course’s first login
Study design

Radiographers
- Pre-test
- 21 days
- Intervention: 21 days (Course), 20 days (Post-test), 5 days (Satisfaction questionnaire)

Students
- Pre-test
- 21 days
- Intervention: 21 days (Course), 20 days (Post-test), 5 days (Satisfaction questionnaire)

Control
- Post-test
- 21 days

Drop-outs: lost-to-follow-up or discontinued intervention
Statistical analysis

- Normality
  - Kolmogorov-Smirnov test (total sample)
  - Shapiro-Wilk test (for each group)

- Homogeneity
  - Mann-Whitney U test
  - Chi-square test or Fisher's exact test for nominal variables

- Significance level: 5%

- IBM SPSS Statistics®, V. 17.0
4. Impact results focusing on learners’ satisfaction
Results

Radiographers

#120
9 days

#190
Students

#70
9 days

#39

#68

#34
3 lost-to-follow-up
5 days
2 discontinued intervention
13 days
1 day

#19

#16

#11

#26

#29

8 lost-to-follow-up
41 days
7 days

#19

#20

#34

#34

9 days
7 lost-to-follow-up
15 days
2 discontinued intervention
2 days

#16

3 lost-to-follow-up
41 days
3 days

33
### Sample description

<table>
<thead>
<tr>
<th></th>
<th>Students (n=11)</th>
<th>Radiographers (n=29)</th>
<th>Total (n=40)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.182</td>
</tr>
<tr>
<td>Female</td>
<td>9 (82)</td>
<td>24 (83)</td>
<td>33 (83)</td>
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</tr>
<tr>
<td>Male</td>
<td>2 (18)</td>
<td>5 (17)</td>
<td>7 (17)</td>
<td></td>
</tr>
<tr>
<td><strong>Age, med (P25;P75)</strong></td>
<td>21 (21;22)</td>
<td>31 (27;39)</td>
<td>28 (23;35)</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Academic qualifications, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd year</td>
<td>4 (36)</td>
<td>3 (10)</td>
<td>4 (10)</td>
<td></td>
</tr>
<tr>
<td>4th year</td>
<td>7 (64)</td>
<td>23 (80)</td>
<td>23 (58)</td>
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<tr>
<td>Bachelor</td>
<td>3 (10)</td>
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<td>3 (7)</td>
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<td>Graduation</td>
<td>23 (80)</td>
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<td>23 (58)</td>
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<tr>
<td>Master</td>
<td>3 (10)</td>
<td></td>
<td>3 (7)</td>
<td></td>
</tr>
<tr>
<td><strong>Years of profession, med (P25;P75)</strong></td>
<td>9 (4;18)</td>
<td>9 (4;18)</td>
<td>9 (4;18)</td>
<td></td>
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<tr>
<td><strong>Routine mammography</strong></td>
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<tr>
<td>0</td>
<td></td>
<td>12 (42)</td>
<td>12 (30)</td>
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<tr>
<td>&lt;30 per week</td>
<td></td>
<td>12 (42)</td>
<td>12 (30)</td>
<td></td>
</tr>
<tr>
<td>30-40 per week</td>
<td></td>
<td>2 (6)</td>
<td>2 (5)</td>
<td></td>
</tr>
<tr>
<td>&gt;40 per week</td>
<td></td>
<td>3 (10)</td>
<td>3 (8)</td>
<td></td>
</tr>
</tbody>
</table>
Efficacy and effectiveness

- There was **evolution in knowledge** from those who performed the course
  
  (23 pp; \( p=0.004 \))

- 81% individuals **accepted** to perform the course
  
  - 9% participants did not conclude the course (discontinued intervention)
Satisfaction

• Satisfaction questionnaire

  • Global measures (last two questions, Q25 and Q26):
    
    • 85% participants were satisfied (students vs. Radiographers, p=0.835)
    
    • 87.5% participants considered the eLearning course successful (p=0.698)
Satisfaction

- Satisfaction questionnaire
  - Content (Q1-Q4)
  - Interface and navigation (Q5-Q15)
  - Personalisation (Q16-Q20)
  - Learning community (Q21-Q24)
Q1. The eLearning system provides content that exactly fits your needs.

Q2. The eLearning system provides useful content.

Q3. The eLearning system provides sufficient content.

Q4. The eLearning system provides up-to-date content.
Interface and navigation (Q5-Q15)

Q5. The eLearning system is easy to use.
Q15. The eLearning system provides testing results promptly.
Q8. The eLearning system is user-friendly.
Q7. The content provided by the e-learning system is easy to understand.
Q9. The operation of the e-learning system is stable.
Q6. The eLearning system makes it easy for you to find the content you need.
Q12. The testing methods provided by the e-learning system are easy to understand.
Q10. The eLearning system responds to your requests fast enough.
Q11. The eLearning system makes it easy for you to evaluate your learning performance.
Q14. The eLearning system provides secure testing environments.
Q13. The testing methods provided by the e-learning system are fair.
Q16. The eLearning system enables you to control your learning progress.

Q17. The eLearning system enables you to learn the content you need.

Q18. The eLearning system enables you to choose what you want to learn.

Q19. The eLearning system records your learning progress and performance.

Q20. The eLearning system provides the personalised learning support.
Q24. The eLearning system makes it easy for you to access the shared content from the learning community.

Q23. The eLearning system makes it easy for you to share what you learn with the learning community.

Q21. The eLearning system makes it easy for you to discuss questions with your teachers.

Q22. The eLearning system makes it easy for you to discuss questions with other students.
E-Learning experience

- 4/40 participants had eLearning experience
  - 2/4 had health related eLearning experience
- Overall satisfaction did not differ between these participants and those who had no experience (Q25: $p=0.262$; Q26: $p=0.207$)
- Q11: easy evaluation of the learning process ($p=0.042$)
5. Discussion and conclusions
Discussion

- The participants who concluded the course were very satisfied
- Comments highlighted the intuitive interface and the useful content
- No significant differences between students and radiographers
Discussion

• High degree of satisfaction
  • Interface
  • Content

• Lower degree of satisfaction
  • Learning community
  • The development of the course did not take that into consideration

• Q11 – evaluation learning performance
  • Learners with previous experience showed lower satisfaction
  • Improvement of the course concerning this component
• Inexistence of a satisfaction questionnaire in Portuguese
  
  • Validity should be carefully discussed
  
  • Translation can be a starting point
  
• Moderate sample
  
• Innovative character on breast imaging learning for radiographers in Portugal
Research contributions

- Provides a new easy-to-use eLearning course
- Contributes to the breast imaging learning
- Emphasises the continuing education and professional development
- Fills the lack of randomised control trials in the eLearning evaluation
- User’s satisfaction is an important contribution for better eLearning systems thus providing more effective knowledge gain