Innovative Tablet Based Curriculum for Radiology Resident Education

Celebration of Medical Education Scholarship
November 20th, 2013

Summit H. Shah, M.D., M.P.H., Mark A. King, M.D.

The Ohio State University Wexner Medical Center
Department of Radiology
Columbus, OH
ACKNOWLEDGEMENTS

- All the faculty in The Department of Radiology who contributed to creation of the iBooks

- David Way and Rollin Nagel for presentation and statistical help

- Faculty Teaching Scholars Program
The resident learning experience is often varied and self-motivated with a nonspecific curriculum.

More research is needed to set standards for efficient, innovative methods of delivering this information, especially using increasingly common tablet devices such as the iPad.¹

Radiology resident education is especially suited for tablet use given its image-rich subject matter.
PURPOSE

- Our study aims to prospectively examine the impact of a complete tablet-based curriculum on radiology resident motivation, satisfaction and engagement.
HYPOTHESIS

Implementing a tablet-based radiology residency education curriculum will improve:

- Resident studying efficiency with easier, more organized access to information
- Motivation to study (and total time spent studying)
- Preparation for the board exam
- Active learning during conference
- Overall satisfaction with studying resources
METHODS

- A tablet-based curriculum was implemented in 2012
- 3 components:
  - 1. Development of subspecialty-specific modules using the iBooks author application and following the official American Board of Radiology study guide
  - 2. Creation of a virtual resident library with online access to most major radiology textbooks, giving residents the option to view and download pdf versions of textbooks
  - 3. Providing all junior residents iPad tablets and $500 to senior residents to do the same
METHODS – iBooks Demo

- http://www.youtube.com/watch?v=zbNOr351wyA
METHODS

- 12 question pre- and post-surveys administered to all our radiology residents
  - Identical surveys, 9 months apart

- Results were analyzed using the chi-squared ($X^2$) test.
SURVEY

1. On average, approximately how many hours per day do you spend studying radiology-related materials outside of work?
   - <15 minutes, 15-30 minutes, 30 minutes – 1 hour, 1 hour – 2 hours, >2 hours

2. Approximately, how much of your time spent studying radiology outside of work is ON A TABLET DEVICE?
   - 0-25%, 25-50%, 50-75%, 75-100%

3. On average, approximately how many hours per day do you spend studying radiology-related materials while at work, not including daily conference?
   - <15 minutes, 15-30 minutes, 30 minutes – 1 hour, 1 hour – 2 hours, >2 hours

4. Approximately, how much of your time spent studying radiology AT WORK, not including daily conference, is ON A TABLET DEVICE?
   - 0-25%, 25-50%, 50-75%, 75-100%
SURVEY

5. My current study resources are well organized.
   - 5-point likert scale

6. My current study resources are easily accessible.
   - 5-point likert scale

7. My current study resources encourage active learning.
   - 5-point likert scale

8. My current study resources motivate me to study radiology on a daily basis.
   - 5-point likert scale

9. I feel that my current study resources will adequately prepare me for the radiology board exam.
   - 5-point likert scale
10. Overall, I am currently satisfied with the study resources provided by my residency program.
   - 5-point likert scale

11. How often do you use a tablet device to assist with learning during daily lecture?
   - 0-25%, 25-50%, 50-75%, 75-100%

12. I feel that using a tablet device during daily lecture improves learning.
   - 5-point likert scale
RESULTS

- 22 residents (81%) completed the survey before and after implementation of the tablet-based curriculum.
  - 3 residents were excluded for only completing either the pre- or post-survey

- All questions demonstrated an aggregate improvement on the post-survey results compared to the pre-survey results
# RESULTS

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Survey</th>
<th>Post-Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spent more than 1 hour studying outside of work</td>
<td>41%</td>
<td>68%</td>
</tr>
<tr>
<td>2. Spent at least 25% of time studying on a tablet outside of work</td>
<td>45%</td>
<td>68%</td>
</tr>
<tr>
<td>3. Spent at least 30 min studying at work</td>
<td>59%</td>
<td>68%</td>
</tr>
<tr>
<td>4. Spent at least 25% of time studying on a tablet at work</td>
<td>36%</td>
<td>50%</td>
</tr>
<tr>
<td>5. Agree or strongly agree that study resources are well organized</td>
<td>32%</td>
<td>72%*</td>
</tr>
<tr>
<td>6. Agree or strongly agree that study resources are easily accessible</td>
<td>41%</td>
<td>90%*</td>
</tr>
</tbody>
</table>

*statistically significant with a p<0.05
<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Survey</th>
<th>Post-Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Agree or strongly agree that study resources encourage active learning</td>
<td>27%</td>
<td>77%*</td>
</tr>
<tr>
<td>8. Agree or strongly agree that study resources motivate to study radiology on a daily basis</td>
<td>18%</td>
<td>81%*</td>
</tr>
<tr>
<td>9. Agree or strongly agree that study resources will adequately prepare for radiology board exam</td>
<td>36%</td>
<td>81%*</td>
</tr>
<tr>
<td>10. Agree or strongly agree that overall satisfied with study resources provided by residency program</td>
<td>36%</td>
<td>81%*</td>
</tr>
<tr>
<td>11. Used tablet at least 25% of the time during daily lecture</td>
<td>32%</td>
<td>59%</td>
</tr>
<tr>
<td>12. Agree or strongly agree that using tablet device during daily lecture improves learning.</td>
<td>50%</td>
<td>68%</td>
</tr>
</tbody>
</table>

*statistically significant with a p<0.05
RESULTS

Radiology Education Survey

Response

Pre
Post

Question Number

1
2
3
4
5
6
7
8
9
10
11
12
RESULTS

- 6 of the 12 questions showed a statistically significant improvement from the pre-survey to the post-survey using the likert scale:
  - Study resources are well organized
  - Study resources are easily accessible
  - Study resources encourage active learning
  - Study resources motivate to study radiology on a daily basis
  - Study resources will adequately prepare for radiology board exam
  - Overall, satisfied with study resources provided by the program

- The results were all statistically significant with a \( p < 0.01 \)
DISCUSSION

- Previous studies have examined some of the positive effects of tablet devices on radiology resident education.\textsuperscript{4,5}

- Our prospective study went further by implementing a full tablet-based curriculum with subspecialty-based iBooks.
DISCUSSION

- Nine month time span between surveys allowed for potential “novelty effect” to wear off

- While a few questions regarding study time and tablet use during conference did not demonstrate statistically significant improvement, this may be secondary to our small sample size
IMPLICATIONS

- The results further strengthen the research on the benefits of heavily integrating tablet technology into the radiology resident curriculum.

- Applications such as iBooks author have the potential to dramatically transform content delivery in residency education.

- Several medical schools and other residency programs are already beginning to see the benefit of implementing a tablet-based curriculum.
LIMITATIONS

- The study is limited by a small radiology class sample size with a total of 22 residents completing both surveys and study not randomized

- Long-term effects may be variable, although we did assess 9 months out

- Inherent limitation with likert scale options

- Subjective responses with actual improvement in knowledge / test scores not proven
FUTURE DIRECTIONS

- Assessing improvement in knowledge through tests and/or board scores

- Surveys directly assessing impact of iBooks

- Testing other applications of tablet devices in addition to iBooks, E-textbooks and conference viewing
  - ie tablets can also be utilized to incorporate audience response applications, quizzes, etc during conference
FUTURE DIRECTIONS

- Multi-institutional studies with larger populations
- Extending iBooks and tablet curriculum to medical student education in radiology
REFERENCES


QUESTIONS?
Thank you.

If you have any further questions, please contact Summit Shah – summit.shah@osumc.edu.