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Authors

Moshtaghi, Omid
Haidar, Yarah M
Sahyouni, Ronald
et al.

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Use of Interactive iBooks for Patient Education in Otology

Omid Moshtaghi, B.S.[*], **Yarah M. Haidar, M.D.**[*], **Ronald Sahyouni, B.A.**, **Ramin Rajaii, MS**, **Afsheen Moshtaghi, B.S.**, **Amin Mahmoodi**, **Yaser Ghavami, M.D.**, **Harrison W. Lin, M.D.**, and **Hamid R. Djalilian, M.D.**

Department of Otolaryngology-Head & Neck Surgery (All authors), Department of Biomedical Engineering (AM, HRD), University of California, Irvine, Irvine, CA, USA

Abstract

Introduction—Physicians in the ambulatory setting face challenges in adequately educating patients in a brief office encounter.

Objective—To evaluate the efficacy of an iPad-based interactive educational module (iBook) in various otologic pathologies.

Methods—Patients presenting with symptoms of tinnitus, dizziness, hearing loss, or cochlear implant evaluation were included. In total, 44 patients received the iBook and 22 patients served as controls. Prior to viewing the iBook, patients completed a pre-survey to assess baseline knowledge. After viewing the iBook, patients completed a post-survey to assess changes in perception and knowledge of their disease. Results were compared to that of the control group who did not receive iBook supplementation prior to being seen by the physician.

Results—Paired t-test analysis showed significant improvements ($p < 0.01$) in both self-reported perception and concrete understanding in various concepts when compared to pre-iBook results. This was further compared to the control group, which showed a significant gain in factual knowledge ($p = 0.02$).

Conclusion—Patients who viewed the iBook, personalized to their diagnosis, displayed significantly improved understanding of their condition. Increased use of interactive educational modalities, such as the iBook, can be of benefit to an otologic practice in improving patient education and satisfaction.

Keywords

patient education; iBook; interactive; understanding; knowledge; tinnitus; dizziness/vertigo; hearing loss; cochlear implant

Introduction

Time constraints can prevent physicians from sufficiently addressing patients' concerns during the office visit. Consequently, patients may become dissatisfied, confused, and

Corresponding author: Hamid R. Djalilian, M.D., University of California, Irvine, Otolaryngology – 5386, 19182 Jamboree Road, Irvine, CA 92697, hdjalili@uci.edu, Phone: (714) 456-5853, Fax: (714) 456-5747.

[*]These authors contributed equally to this work

frustrated, all while perceiving a reduced quality of clinical care.[1,2] Physicians have also expressed dissatisfaction with this limited amount of time.[3] Faced with time limitations, large amounts of information, and inadequate educational material, patients may not fully comprehend the nuances of their medical condition by the end of the office visit. In addition, some health systems are beginning to partly compensate physicians based on patient satisfaction and reviews. Sometimes, the patient's satisfaction is more dependent on a subjective happiness with the visit rather than whether the treatment rendered was efficacious. This dependence of patient satisfaction on subjective issues is primarily since the surveys to measure this are sent to patients within a week or two of their visit. Therefore, the physician has to depend on other means of improving patient satisfaction through education of the patient without increasing the visit duration.

Patient-physician communication is also complicated by variations in patient education, language, and culture.[4] Limited literacy has been shown to hinder patients' understanding and management of their disease.[5] In the U.S., 50% of adults have difficulty understanding medical jargon often used by physicians.[6] Providers unaware of this issue may overwhelm patients with unnecessarily complex terminology during the visit. Additionally, psychosocial factors including a patient's fear of judgment or condescension, may prevent the patient from revealing their lack of understanding.[7,8] This miscommunication has significant consequences on patient satisfaction, treatment compliance, quality of care, incidence of malpractice claims, and likelihood of patients returning for care.[9,10]

As a result, patient education continues to be a challenge many specialties. To alleviate these challenges in otolaryngology, educational pamphlets published by the American Academy of Otolaryngology were created and shown to be beneficial in patient education.[11] Nevertheless, these pamphlets were fairly challenging to read and comprehend.[12] Given the lack of available resources, patients often frequent websites such as YouTube or Wikipedia to augment self-education.[13,14]

In an outpatient practice, there is potential for the use of interactive, electronic tools to improve patient education and streamline care. Studies have shown that using a mobile device, such as the Apple iPad, can be an effective instructional aid in academic subjects such as anatomy and pre-operative patient education.[15,16] It has been well established that active engagement with interactive resources is more effective than passive reading of or listening to static informational resources.[17-20]

In this study, we explored active engagement by incorporating interactive, electronic educational materials to advance patient education in an ambulatory setting. Utilizing iBooks' display and a dynamic array of elements including animations, videos, illustrations, and photo galleries, we assessed the impact of iBook supplementation on patient understanding in four common neurotologic pathologies.

Materials and Methods

For one month, we evaluated consecutive new patients presenting to our tertiary care neurotology outpatient practice. Only patients presenting with a chief complaint of tinnitus,

dizziness, hearing loss, or cochlear implant evaluation were included. Based on the chief complaint, patients were given an iBook corresponding to their pathology after checking in at the front desk. The patients then reviewed the iBook in the waiting or exam room prior to being seen by the physician. Patients were randomly assigned to two groups; one group received the iPad, while the other did not and served as the control. Surveys employed a Likert Scale to assess patients' technological comfort level with the iPad, as well as understanding of their condition and potential treatments. Patients were surveyed about their perception of knowledge using a five-question survey. Patients' actual knowledge was tested by five true/false questions about their disease before and after iBook review. Surveys were administered in the waiting room, and patients were subsequently seen by the physician to clarify any concerns or ambiguities from the reading. Patients in the control group received a pre-survey to assess their perception of knowledge (subjective) and actual knowledge (based on objective testing) in the waiting room. They then received a post-survey after seeing the physician to assess changes.

Although four distinct pathologies were assessed, surveys employed a similar question structure. Question 1 (Q1) of each survey addressed patient knowledge of their condition. Q2 addressed patient understanding of post-treatment expectations. Q3 addressed knowledge of treatment options. Q4 addressed understanding of the long-term treatment expectations. Lastly, Q5 addressed patient knowledge of potential risks and side effects.

Four iBooks were created on tinnitus, dizziness, hearing loss, and CI. The iBooks were developed on a 32GB iPad (4th generation) using *iBooks Author,* a native application found on the Apple operating system. iBooks were written by the research team using simplified lay language (Figure 1). Statistical analyses were performed using MATLAB® R2015b.T-tests used a 95% confidence interval and rejected the null hypothesis for $p < 0.05$.

Results

The patient cohort included 70 patients. The presenting symptoms included 12 with tinnitus, 19 vertigo/dizziness, 29 hearing loss, and 10 presented for CI evaluation. Of the 70 patients, 4 had incomplete surveys and were excluded from the study, leaving 66 patients in the study. Educational backgrounds were self-identified as having the following degrees: 4 having less than a high school degree, 18 with high school, 13 with trade school, 17 with college, and 14 graduate degrees (Table 1).

Considering all data in aggregate, paired *t*-test analysis of Q1, 2, 3, 4 and 5, measuring perception of knowledge gained, showed statistically significant improvement after reading the iBook ($p < 0.01$, confidence interval 95%). On average, scores for the patients receiving the iBook improved by 26% on the Likert scale (Figure 2a).As further validation, paired *t*-test analysis of objective, factual knowledge also showed significant improvement after iBook review in all groups ($p < 0.01$, CI 95%). On average, there was a 27% increase in the number of correct objective responses in the iBook group (Figure 2b). This compared to 13% and 1% change in the scores in the control group for subjective and objective knowledge, respectively.

Responses were also stratified by self-reported education level. Among all educational levels, paired *t*-test analysis of questions measuring perception of knowledge, showed significant improvement after iBook review ($p < 0.01$, CI 95%) (Figure 3a). Paired *t*-test analysis of responses showed significant improvement in factual knowledge gained for patients of all educational backgrounds, with the exception of those without a high school diploma ($p = 0.331$). Statistical significance for patients with high school, trade school, college, and graduate levels of education had values of: $p < 0.01$, $p < 0.024$, $p < 0.01$, and $p < 0.01$ respectively (Figure 3b).

Responses were also stratified by iBook topic. Among all pathologies, paired *t*-test analysis of responses showed significant improvements in both perception and factual knowledge gained after iBook review ($p < 0.01$, CI 95%) (Figure 4a, b). Despite this, benefits were not seen equally for all topics. Patients with a diagnosis of vertigo exhibited the lowest baseline knowledge and subsequently, the greatest improvement in factual knowledge, with a 50% average score increase.

In patients that did not receive the iBook and received education only from the physician, we observed lower gains in both perception and factual knowledge (Figure 5). This was compared to gains from the group that received iBook supplementation. The difference in perception of knowledge gained was not significant between the two groups ($p = 0.08$, CI 95%). However, factual knowledge gained with iBook use was statically significant when compared to those who did not receive iBook supplementation ($p = 0.02$, CI 95%).

Of the patients presenting to our clinic, 89% had previously seen a physician regarding their disease, while 76% had researched their condition before the appointment. Of the group receiving the iBook, 87% believed that the iBook enhanced their clinical experience while 92% found the iBook to be a valuable educational tool. Surveys also indicated that 87% of patients learned more about their specific disease and 95% of patients agreed that they would prefer increased use of iBooks in a healthcare setting.

Discussion

This study found that interactive, electronic educational modalities enhance both perception of and improvement in knowledge of four common neurotologic diagnoses. Additionally, although the majority of patients had previously researched their condition or spoken to a physician prior to iBook viewing, 87% still felt they learned novel information, while 92% found the resource useful. The iBooks allowed the physician to present a validated resource to patients, utilizing time often wasted in the waiting room. This is the first study to examine the use of iBooks in patient education in an academic, ambulatory otologic setting and supports previous literature demonstrating the benefit of iBooks in patient education.[16]

Prior studies have established that patients with higher educational levels perceive care differently than patients with lower educational backgrounds.[21] These findings were evident in our patient population as well. Even though, patients of all educational backgrounds experienced an improvement in the perception of knowledge, factual knowledge gained was not achieved equally. While those with graduate degrees had the greatest improvement in

factual knowledge gained, this cohort had the lowest pre-survey knowledge of their disease before reading the iBook. This suggests that those with higher education may not have increased baseline knowledge of their disease. This has substantial implications for physicians who may incorrectly assume that patients with advanced degrees are more knowledgeable about their condition, and thus require less explanation.

Regardless of the pathology, all groups demonstrated a statistically significant improvement in perception of knowledge and actual knowledge gained with iBook use. Vertigo patients had the lowest pre-survey perceived and actual knowledge of their disease when compared to the other pathologies. Despite this, post-survey scores of vertigo patients were comparable to all other pathologies. This may suggest that vertigo patients would benefit most from the iBook. Of the diseases that we studied, vertigo likely has the most complex underlying pathophysiology, which can be difficult for patients to understand. Therefore, the informational material needs to be more comprehensive for patients with vertigo. Even without iBook supplementation, it is evident that these patients require more resources to assure understanding and comprehension of vertigo.

Lastly, it is evident that those presenting for evaluation of hearing loss benefited least from iBook education. Because of the many causes of hearing loss, it was difficult to create an all-encompassing iBook that covered all the etiologies and treatments of hearing loss. This may suggest that patients presenting with hearing loss are least likely to benefit from iBook education and may need customized education by the physician that is tailored to their specific underlying cause and treatment of their hearing loss. Although not empirically assessed, the cohort that reviewed the iBook had a shorter appointment time. This is likely due to the establishment of a baseline understanding of the disease by the patient, and excess time was no longer spent on explaining its pathophysiology, and instead the conversation was focused on specific issues and treatment approaches. Furthermore, physicians noted a better patient interaction in this context.

When comparing the control group to those receiving iBooks, our study suggests that iBook supplementation is superior to physician education alone and can increase patient satisfaction. Although a statistically significant difference in perceived knowledge did not occur with use of the iBook, it was clear this did not have an impact on the overall patient satisfaction. In this cohort, 87% endorsed an enhanced clinical experience, after iBook use which was potentially tied to the doctor-patient conversation. In addition, physicians reported a greater satisfaction with patient encounters as well.

This study is limited in that it only assessed short-term content retention, since the pre- and post-surveys were administered during the same visit. Future studies should focus on assessing long-term recall. Furthermore, potential studies can evaluate the interactive mode of delivery to engage the reader in the iBook by comparing iBook supplementation to patients receiving a non-interactive educational resource, such as an informational pamphlet. The control group would be provided identical information using printed material and would allow us to make further inferences on the means in which patients learn new information. More extensive patient satisfaction surveys, e.g. Press-Gainey, may be beneficial in the future.

Conclusion

Patients of all educational backgrounds and otological pathologies demonstrated improved subjective understanding of conditions and treatment options using interactive educational interventions. This was validated by a simultaneous improvement in objective knowledge. Implementation of iBooks to augment patient education should be investigated in other medical specialties and patient populations.

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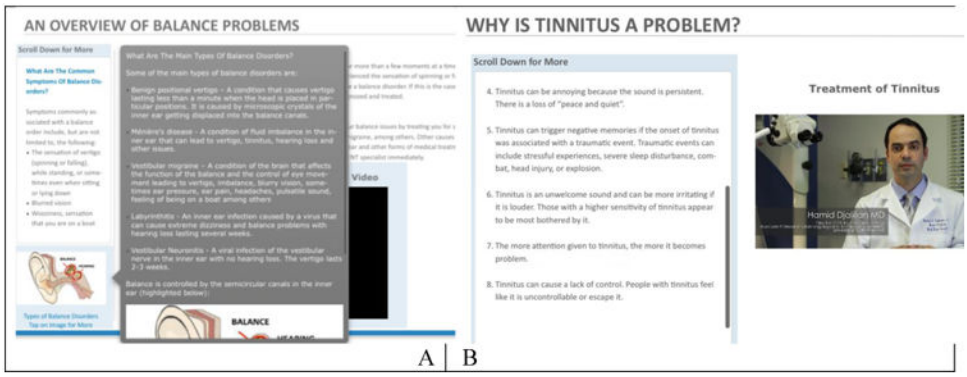

Figure 1.

(A) Screenshots of various pages in the vertigo iBook, illustrating integration of pop-up information and video clips. (B) Screenshots of tinnitus iBook, illustrating a custom video describing tinnitus.

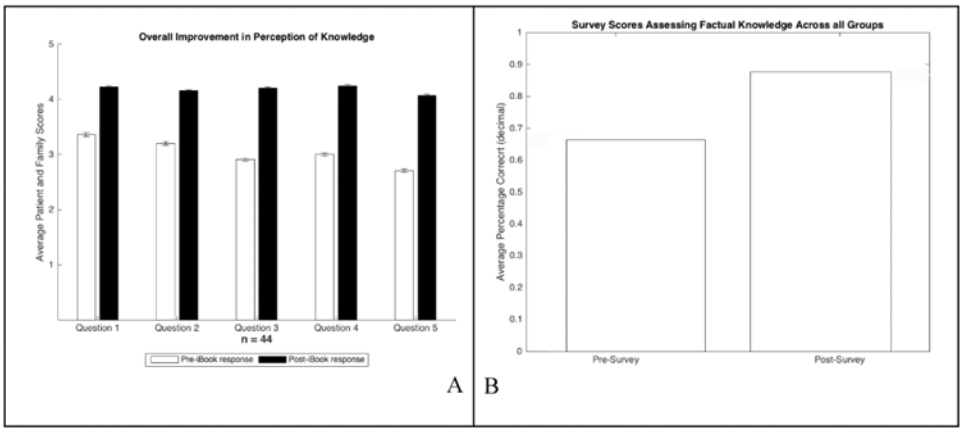

Figure 2.

(A) Average improvement to questions 1 through 5 assessing perception of knowledge. (B) Overall percent correct in survey's assessing factual knowledge.

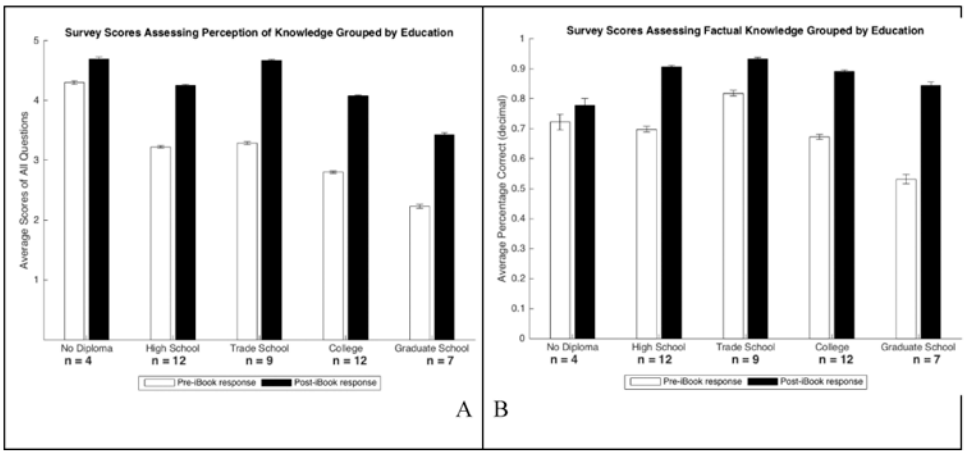

Figure 3.

(A) Average score improvement in perception of knowledge stratified by self-reported education level. (B) Average score improvement in factual knowledge gained stratified by self-reported education level.

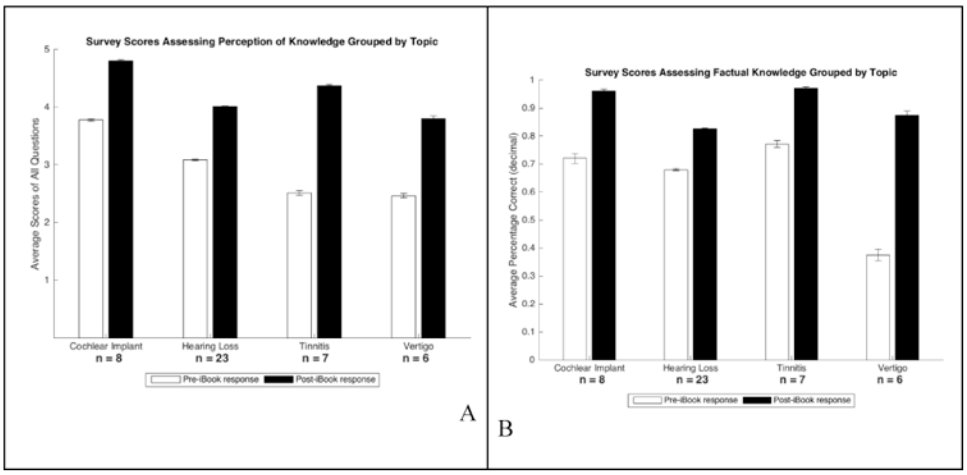

Figure 4.

(A) Average pre and post scores in perception of knowledge stratified by pathology. (B) Average pre and post scores in factual knowledge stratified by pathology.

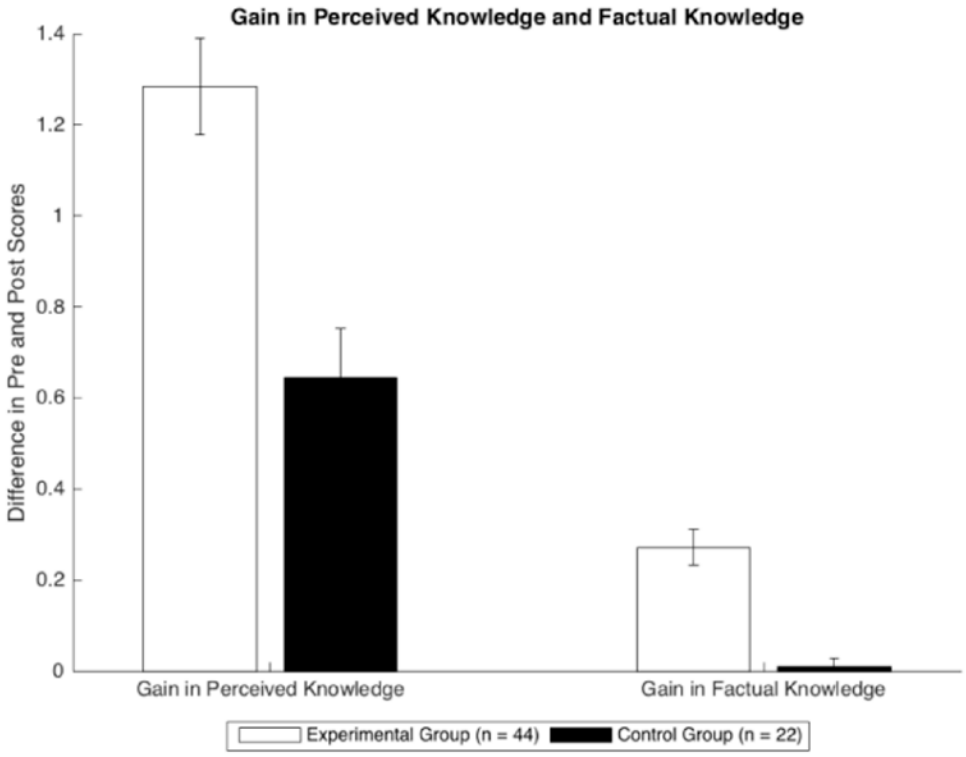

Figure 5.

Average pre and post scores difference in perception of knowledge and factual knowledge in control group and experimental group.

Table 1

Demographic of patients surveyed.

Grouping	Number of Patients included in the study
Primary Complaint	
Tinnitus	12
Vertigo/Dizziness	15
Hearing Loss	29
Cochlear Implant	10
Education	
Not Finished High School	4
High School	18
Trade School	13
College	17
Graduate School	14
Total	66