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## Continuing Mobile Medical Education: The College of Optometry Web CE Mobile App Project

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## Continuing Mobile Medical Education: The College of Optometry Web CE Mobile App Project

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# Continuing Mobile Medical Education: THE COLLEGE OF OPTOMETRY WEB CE MOBILE APP PROJECT



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## Introduction

Evidence-based medicine has been defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients." [1] Before the Information Age, evidence-based medicine was much more difficult to practice. Without fast, random access to real-time information, it is no wonder that it's opposite—eminence-based medicine—was the standard of care for so long.

Eminence-based medicine might be defined as decision-making in consultation with senior medical staff. [2] Somewhat surprisingly, eminence-based medicine is still the standard in many places. It is understandable in situations that lack access to information technology, but that is not the only reason. It is often the case that the busy clinical setting also limits real-time access to evidence. Put simply, it's often faster just to ask those around you when faced with a treatment dilemma.

Mobile technology changes this equation. The portability of the smartphone and quick-access time of mobile apps makes evidence-based medicine more readily available to all but the busiest and remotest health care providers. Also, as the standard of care changes, mobile apps hold great promise for use in continuing medical care education, as long as health care providers trust the evidence. High-level patient care has created a need for rapid access to emerging evidence.

Continuing Mobile Medical Education (CMME) has evolved to address this need. CMME can be evaluated by traditional criteria used for promotion in health care academia. These criteria include clinical services, research and scholarly work, education, and public service.

This article aims to explore some ways in which mobile apps are effectively used in health care, and specific applications to continuing education for optometry on the web. These ways include:

1. Improved clinical diagnosis of visually-distinct conditions.
2. Improved clinical treatment for complicated conditions.
3. Improved availability of evidence for research and scholarly work.
4. Psycho-social applications for patients and allied health personnel.
5. Home monitoring of patient conditions and home training of physicians.

Each of these is discussed in detail, below.

### 1. Improved Diagnosis for Visually-Distinct Conditions

CMME can be used to help in diagnosis, particularly for conditions that are photographable. In eye care, one of these is diabetic retinopathy. While this condition can lead to leakage of capillaries in the retina and elsewhere, there are subtle changes that even seasoned eye doctors can miss if they are not trained in diagnosis of diabetic retinopathy (DR). See Figure 1 for an obvious case of diabetic retinopathy.



Figure 1: Proliferative Diabetic Retinopathy. [23]

A study by Sundling et. al. [3] in Norway looked at the ability of optometrists to identify this condition from photographs send by e-mail. With a sensitivity of 67% and a specificity of 84% for any DR, and a paltry 54% for subtle non-proliferative DR, only 4 out of 74 optometrists were able to meet the required standard of 80% sensitivity and 95% specificity for diabetic eye disease. This is a significant finding, because there are likely over 100,000 Norwegians with diabetes in this small country, about one-fifth of whom have DR.

In an unrelated Norwegian study, Jemec and colleagues [4] investigated whether a web-based course with electronic support from a dermatologist would change behavior with regard to atopic dermatitis. Specifically, the student investigated topical steroid treatment duration and the referral rate to dermatology between the web course participants and a control group of doctors. The course used was complemented by color audio-video footage. While the treatment interventions by primary care doctors did not change, the referral rate decreased from 30% to 11% with the web-based course on this acute disease.

## **2. Improved Treatment for Complicated Conditions**

CMME has been proposed for increasing early detection of common disease, as well as for the training of healthcare workers dealing with potentially fatal diseases like HIV / AIDS.

Vision screenings have been shown to be effective, low-cost interventions to detect amblyopia (lazy eye) and strabismus (eye turns) in school-aged children. Unfortunately, pediatricians have less than a 20% vision screening rate for children, and, thus, often fail to detect lazy or turned eyes. [5] As a result of low screening rates and imperfect screenings, only about one in three children with strabismus or amblyopia are detected in primary care settings. Online education was not entirely successful in remediating this deficit in these busy doctors, particularly with regard of the fact that more than one-third of lazy eyes are undetectable by pediatricians.

In a 2009 study, which is nearly venerable by modern technology standards, CMME has also been used to train HIV / AIDS healthcare workers in Peru. At the time of the study, routers to provide wireless connections and portable solar chargers were necessary to keep the smartphones working, due to lack of infrastructure and healthcare providers. The authors write that "Peru does not have an adequate healthcare workforce to meet the population's demand for services." [6] The use of pre-tests, clinical cases, Skype-based discussion, review, and assessment were designed to effectively teach these over-worked healthcare providers. See Figure 2).

Two things were discovered in this study. First, a combination of synchronous and asynchronous learning, using Skype and forum participation, was vital to training these workers with 90% compliance. Secondly, even "One of the best smartphones in history on any platform" [7] was not as robust as the contemporary iPhone accessing Skype and social media at the time. Technology rapidly changes, but it may remain true that not all platforms are created equally when it comes to CMME.

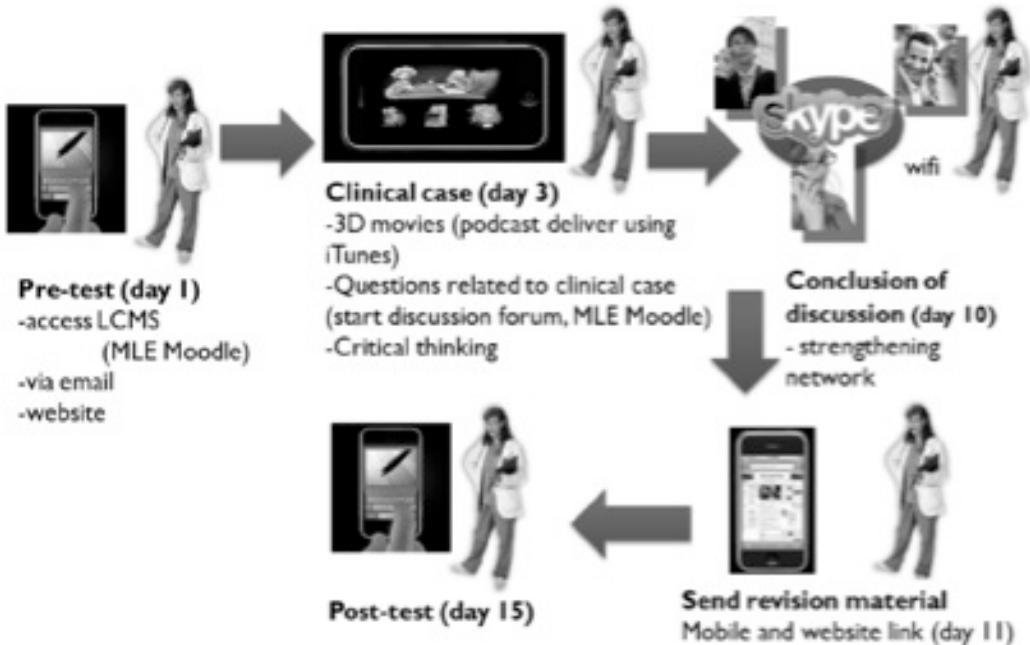


Figure 2: Flow of five clinical modules for HIV/AIDS training in Peru. [6]

### 3. Improved Availability of Evidence in Clinical Settings

Another approach to CMME is to make textbooks widely available to doctors in training. A landmark study by Hardyman et. al. [8] from 2013 discussed a medical textbook-smartphone interface called “iDoc”. After surveying hundreds of doctors, who used iDoc and submitted case reports, there were several important and specific results of this study. First, to answer clinical questions, trainee doctors still relied on senior staff 80% of the time and ancillary medical personnel just over 50% of the time, with negligible changes from baseline. What did change is reliance on peers, which reduced from 70% to 58% after iDoc was introduced. Use of the iDoc library was significantly higher for first-year and male trainees and for medical skills queries, especially, when senior staff was not available. The patient problem they needed to solve determined their preferred information source. For instance, hard-copy texts were still preferred for speed of access for information-based queries, while senior staff members were relied on for complex queries that were harder to search. Clearly, electronically-searchable textbooks are still a niche resource.

A much smaller study took place with a half-dozen doctors in Botswana. [9] With 40 physicians for every 100,000 citizens and where almost 25% of the population under age 50 is HIV positive, Botswana has some overwhelming health challenges. Even in the cities like the capitol



*Figure 3: University of Botswana Home Screen showing ePocrates and uCentral mobile apps. [9]*

Gaborone, Internet connectivity is limited and functioning desktop computer access even more so. On the upside, since 2009, three-quarters of the world's mobile devices are in use in developing countries and this trend is only expected to continue. Mobile apps like ePocrates, 5-Minute Clinical Consult, and especially uCentral were most popular. Most of the doctors used the smartphone access for supplementary reading outside the hospital and requested increased access to medical journals. See Figure 3 (above).

#### **4. Psycho-Social Applications for Mobile Apps in Healthcare**

A novel application for mobile devices in mental health is to gather confidential intake and history forms from young clients. Whitehouse et al. [10] note that this patient population are at higher probability for “engaging in risky behavior.” There is a standard review of these risk factors, called “Home Education, Eating, Activities, Drugs, Depression, Sex, Safety (HEEADDSS),” but the authors note that “time constraints and patient/provider discomfort reduce implementation,” at least when administered on paper. By making this survey electronic for the 12-18-year-old digital natives whom they serve, the study cites a 99% uptake and completion rate of the 90-question survey in ten minutes or less. The app-based survey is called TickiT, and the process banner (showing tablet use, secure uploading, and upward-trending results) is shown in Figure 4.



Figure 4: TickiT process banner for high-risk behavior history survey [10]

Medical residents were most positive with this survey, while the (presumably older) surgeons were the least positive. The authors also document their trial-and-error experience with icons and color schemes appropriate for their pediatric and young adult audience. This demographic does not include most doctors, unfortunately.

One neglected aspect of CMME is reflection. Renner and colleagues explored app-based reflection, individually and collaboratively, and its effect on hospital staff job satisfaction. [11] The authors defined reflection as “a process “in which people recapture their experience, think about it, mull it over and evaluate it.” While reflection increases job satisfaction, it does not occur by itself and needs support. This author might add the additional value of reflection is to determine the muddy points of a lesson, web-based or otherwise.

## 5. Transportability of Health Professional Skills and Training

Usually, as technology evolves, it becomes smaller. This was not the case with handheld devices. Many will recall that the smaller personal data assistant and smartphones preceded the larger tablet among mobile devices. For many physicians, CMME requires these smaller, pocket-sized devices.

A comprehensive review of the literature as of late 2012 was written by Ozdalga et. al. [12] In the year prior, the authors discovered over 2300 medical apps for smartphones. Just 60 of these were identified as involving patient care, medical reference, or continuing education. An example of CMME using specialty challenges is shown in Figure 5.



Figure 5: Specialty challenges used for CMME [12]

Several examples are given, including:

- iWander, an app that allows for the location monitoring of dementia patients with GPS tracking.
- A Bluetooth electrocardiogram (ECG) that allows a patient to monitor heart function while exercising or during sleep apnea.
- Automatic gait and balance monitoring in post-stroke patients using an accelerometer placed in their shoes.
- Monitoring of diabetic control and malaria treatment with proper data entry and review by the health care team.
- Patient apps for alcohol abuse, exercise, relaxation, smoking cessation, and weight loss.
- iTriage, providing location and waiting times for local emergency rooms.
- Epic, which allows doctors to access electronic health records from their smartphones.

While the smartphone alone is not a medical panacea, it is clear that it has the potential to improve independent living for those with health challenges. However, without the monitoring of health care personnel or the FDA, the authors “did not find evidence that apps led wellness.” The article also takes on the unsubstantiated claim that ePocrates helps reduce medical errors and

saves 20 minutes of doctor time per day.

The authors warn of smartphone apps weakening interprofessional relationships among healthcare personnel and engendering self-diagnosis among patients. Most ominously, they warn of disastrous results when there is over-reliance on medical apps and a smartphone is not available. As the authors put it, “as we become more dependent on technology, we become more dependent on it working flawlessly, with catastrophic implications when it fails.” It seems worrisome that the day is near when a dead phone battery renders doctors impotent. However, the wave is clearly upon us, and, for better or worse, these objections are unlikely to stop it.

Since medical apps can also be used by doctors at a time and place of their choosing, they have the potential to overcome CMME bottlenecks. Many places have taken advantage of this fact already. For example, Rajasekaran et. al. [13] report that in India, up to 50 hours of CE can be taken online, but it has traditionally been used for training allied health personnel about new pharmaceuticals. In this case, doctors, nurses, and health inspectors were offered a training program on immunization. The goal was 50% eligible participation, equal test scores to in-person training, and to “obtain a 20% completion rate in lesser time.” The training was offered through lectures delivered to mobile devices and a custom social networking page. The authors claim good success by using peer-to-peer learning.

This brings us to the College of Optometry’s mobile app project, and the feasibility of creating and persuading optometric physicians to use a mobile app with podcasts, instead of text courses for continuing education.

### ***Web-Based Continuing Education in Optometry***

Like most state-regulated healthcare professions, optometrists require annual continuing education (CE) to maintain their professional licensure. In Oregon, that requirement is 18 hours per year. While at least half these hours need to be completed in person, at live lectures, quality web-based continuing education can make better patient care available to doctors in remote locations, who cannot easily afford to take much time away from their practices to attend regional or national meetings. In states like Oregon, up to 50% of these credits can be obtained by distance education, usually meaning online. Yet, there are limited venues for quality online CE in optometry.

The College of Optometry at Pacific was one of the first in the nation to offer web-based continuing education courses. These courses have traditionally been text-based, with illustrations. In text-based courses, every 3000 words would be counted as a credit, pending passage of a ten-question multiple-choice test at the end. Resembling a journal article, these courses have been

praised for their quality and are popular in over a dozen states, and accepted for credit in all of them. They have been taken internationally as well. Because of this, at its peak of popularity, the Web CE site generated significant revenue for the College each year.

### ***Continuing Education Challenges***

However, the audience for these online CE courses is changing. There is increasing competition for text-based courses. Many are industry-sponsored and free. In recent years, webinars and similar multimedia courses have become popular. All of these changes have resulted in the slow attrition of the Pacific Web CE revenue. Our recent addition of PayPal has been a huge improvement, but by itself is not sufficient.

To continue to ensure Web CE success, a better interface is needed. While text-based courses with heavy, color illustrations lend themselves well to smart phones and tablets, the young, busy OD would often prefer a high-quality podcast format.

Podcast courses have been offered since the University adopted iTunesU several years ago, but to be most effective, an application (or “app”) is necessary.

This proposal details how to make the Pacific Optometry Web CE financially viable for the foreseeable future.

## **II. Method and procedures**

### ***Current Web CE offerings [24]***

While constantly changing, at this writing, the Pacific Web CE site currently offers 20 courses and 27 credits, all approved by the Council of Optometric Practitioner Education (COPE). Additionally, there are many archived courses for which the COPE approval has expired, and there has not been an application for renewal. This makes it by far the largest program of its kind in the county (see Appendix A).

To access the written courses, the practitioner can simply click through to the illustrated text, which has always been available free to read or print in PDF format for those who prefer hard copy. Doctors pay for their continuing education certificate only if they take the COPE-approved exam.

However, as of this printing, the large portion of these courses (10 courses and 11 credits) are in podcast format, with most new courses expected in this format. Instead of prose text, these courses have a written outline at most, and a podcast with synched audio available – if the doctor can access it. A

written transcript in mobile-friendly format, along with a mobile app, would be very useful moving forward. Part of the reason is the podcasts are not very user-friendly.

### ***iTunesU Accessibility***

Audit reports indicate that while they are the minority of courses currently offered for Pacific Web CE, the written courses are still our most popular. The reasons for this discrepancy are not always clear. Sometimes, the podcast audio quality may be to blame. Other times, it may be the doctor's ability to access the podcast that makes these courses sell more slowly than expected.

The University has made these courses possible by offering a public channel on the Apple website, iTunesU. [25] However, it costs the University to make these freely-accessible podcasts searchable from iTunes.com. Instead, doctors must login to the above website as a guest, and then download the podcast onto their hard drive. This requires the downloading and installation of free iTunes software, and the ability to navigate it.

### ***The Proposed Solution***

Since podcast course are meant to be accessed to mobile devices, downloading them to a laptop or desktop, and then synching with a mobile device, is rather cumbersome. Apps are the solution to this problem. iTunesU has a free app available, but apparently doesn't allow easy access to our website. Therefore, a custom app for all major smartphone and tablet platforms is the ultimate solution to our transition to a combination of traditional text-based and the new podcasted Web CE courses. This would also be a recruitment tool to help find new, young authors for our courses.

Writing an app is normally a \$10K proposal if a subcontractor is hired. The new Berglund grants, which funded 500 hours of work-study assistance, allowed us to direct the creation of one an app and mobile-friendly course transcripts for our existing and new web CE courses. The latter required more than typing and medical transcription experience, as the text files needed to be converted to illustrated PDF format for the Seattle Clouds template.

With regard to app programming, we used a template from Seattle Clouds, which allowed us to construct five app platforms (iPhone, iPad, Android, Kindle and web-based) for \$600, including tech support. Although Seattle Clouds continued to own the code, the apps belong to the College of Optometry, and cost about \$900 each to build from the template. Maintenance costs are separate and will likely average at least \$200 a month as new courses are added and old ones are archived.

There was little hardware or software needed for this project that we did not already own. A PowerMac laptop was obtained on loan from University Information Services. Along with Seattle Clouds template, we used funds from a Faculty Development Grant (for 2013-2014) to get a tablet device (iPad), Kindle Fire, and iPhone 4 to Beta test the app on those platforms. Of course, the Android platform needed to be tested as well. A personal phone was used for this purpose. Lastly, for \$15, a copy of iMovie was purchased to allow splitting of the podcasts into 25 MB chunks.

## Future Directions and Conclusions

While the release of our mobile app to the iTunes App Store has been delayed until the new Pacific University mobile-friendly wireframe website is completed in the summer of 2014, we have learned several lessons for moving forward.

Based on the evidence, the evaluation of the mobile app for optometry could include the following testable hypotheses:

1. Testing for each course based on visual inspection of photographs of ocular tissues, like cornea, iris, and retina, as was done in the Norwegian diabetes study. [3]
2. Rates of referral to specialists can be decreased with proper audio-visuals such as video, as in podcast courses on visually noteworthy conditions like atopic dermatitis. [4]
3. Many busy physicians will not necessarily improve their ability to perform screenings for referrals outside their specialty by using an app alone. [5]
4. Recognize that not all platforms are equally fast and easy to use, thus, even the best app for CMME will be prone to platform limitations.<sup>6</sup>
5. Medical textbooks available in mobile format may be most useful for medical skills inquiries in absence of senior staff [8] and in places that do not have reliable desktop Internet connection. [9]
6. Digital natives respond better to mobile technology, including patient intake and history forms, [10] but mobile app reflection on what is learned can be useful to health care providers [11] and teachers alike.

This may be especially true for the solo practitioner.

7. Mobile partnerships such as patient personal data entry for monitoring diseases like diabetes work best when monitored by health care personnel. [12]

8. CMME on new pharmaceuticals and immunizations works best when combined with social networking and peer-to-peer training. [13]

## **Appendix A: Bibliography of Web Continuing Education for Optometry**

There are currently 21 schools and colleges of optometry in the United States. [14] Not all of these have online continuing education. The following is a summary of those that were easy to access, as of 05/23/2014:

1. Indiana University (Bloomington) School of Optometry: 14 courses (23 credits). [15]

2. Northeastern State University (Oklahoma) College of Optometry: 2 courses (20 credits). [16]

3. Pacific University College of Optometry: 20 courses (27 credits). [17]

4. Rosenberg School of Optometry, University of the Incarnate Word: 1 course. [18]

5. Southern College of Optometry (Memphis): 8 courses (9 credits). [19]

6. State University of New York (SUNY): 1 course. [20]

7. University of Houston College of Optometry: 10 courses (13 credits). [21]

8. Western University College of Optometry (Pomona, CA): 16 courses (46 credits). [22]

## **Notes**

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- [15] See: <http://www.opt.indiana.edu/ce/OnLine.htm>
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- [25] See: <http://www.pacificu.edu/itunesu/>