## iPadagogy 101: Using Clinical ORthopedic Exam (C.O.R.E.) to Facilitate Evidence-Based Practice in the Orthopaedic Evaluation Classroom

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Evidence-based practice (EBP) and educational technology have become fundamental skills within athletic training programs. The objective of this article is to share experiences implementing clinical orthopaedic evaluation applications ("apps") that can be integrated into classroom and clinical education to enhance students' proficiency and efficiency utilizing and interpreting special test findings. Today's entry-level allied health professional is expected to have a deeper understanding of special tests than ever before. In addition to developing proficiency in clinical skills, these future clinicians must understand validity statistics in order to select appropriate special tests and interpret the results. The Clinical ORthopedic Exam (C.O.R.E.) application is a database of nearly 250 special tests with descriptions of the test, a video of the special test being performed, and statistical support for the use of the test in reported sensitivity/specificity and likelihood ratios. The series of anatomy applications developed by 3D4Medical.com allows the user to view, zoom, and rotate the joint in 3 dimensions, providing cross-sectional views and virtual layer removal (revealing muscles, connective tissue, bones, vessels, and nerves). Textbooks that overview clinical special tests are not updated often enough to reflect the growing body of research surrounding these techniques. Students and clinicians require the most up-to-date information in order to make sound clinical decisions. The C.O.R.E. application provides access to the most recent peer-reviewed validity statistics. Patient education is also highly valued; the series of applications by 3D4Medical provides vivid anatomical images that can aid in explanation of injury to patients. With EBP a required educational content area within athletic training education and with medical technology becoming commonplace in allied health settings, it is essential that athletic training programs engage students in the use of technology during their classroom and clinical experiences.

Key Words: Special tests, sensitivity, specificity, diagnostic accuracy

## INTRODUCTION

With the release of the fifth edition of the Educational Competencies,<sup>1</sup> implementing evidence-based practice (EBP) within athletic training curriculum is no longer an option. In addition to ensuring that our students are making clinical decisions based on sound evidence, students in entry-level allied health professional programs must be prepared for technology use in the workplace. Medical environments everywhere are embracing evolving technological advances, from laptops in physician exam rooms to expanding the pocket on doctors' coats to hold the iPad. Today's student must be armed with tools that will assist in evaluation proficiency and efficiency, which means that those educating these students must be skilled in utilizing current technologies in the delivery of EBP. The Clinical ORthopedic Exam (C.O.R.E.) application, as well as a series of

anatomy applications developed by 3D4Medical (in collaboration with Stanford School of Medicine), are excellent resources for our students, educators, and practicing clinicians.

The C.O.R.E. application (Figure 1) can be used in the classroom while teaching EBP and can also be used as a daily reference guide for students and clinicians. The application allows the student to easily access information about clinical special tests via anatomical region or by an alphabetical listing if searching for a specific special test. Once a test is selected, the application will provide a description of the test, a video of the special test being performed, and statistical support for the use of the test in reported sensitivity/specificity and likelihood ratios. Possibly the best feature of the application is that the statistical report also includes a short annotated bibliography with a

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Figure 1. Clinical ORthopedic Exam (C.O.R.E.) application (http://itunes.apple.com/us/app/core-clinical-orthopedic-exam/id329470520?mt=8). Logo reprinted with permission.



link to access the full article. A note of caution: if programs are expecting the application to include every special test known to man, it doesn't. However, while new editions of textbooks only come out every few years, this application is updated monthly with the latest clinical research; these updates are received automatically through the App. It should be noted that not all special tests have been researched, so upon clicking on a special test, students often find the statement "This test has been described, but no studies were found that look at diagnostic properties," which provides additional opportunities to discuss the need for further research to inform our profession. The application provides multiple names describing the same test (or similar tests) and links the user back to the original test. Our evaluation courses use this with a Differential Diagnosis worksheet (Figure 2) that is specific to each joint of the body. This worksheet prompts the selection of the best test to meet the symptoms described by the patient.

Applications by 3D4Medical are focused on regions and systems of the body. As they were developed for Stanford University medical school students, they include detailed anatomy and video illustrations on location and function of the anatomy throughout the body. Each application allows the user to view, zoom, and rotate the body segment in 3 dimensions, providing cross-sectional views and virtual layer removal (revealing muscles, connective tissue, bones, vessels, and nerves). While all of the applications are useful for the field of athletic training, the application covering the head and central nervous system is an excellent teaching and learning tool for classroom discussions centering on today's hot topic of concussion. Alongside that, if teaching evaluation of the body, the applications that address each joint are amazing additions to the classroom and facilitate learning with preceptors at clinical sites. The applications can be only purchased individually; however, throughout the year 3D4Medical offers a selected application free or at an extreme discount. An effective approach with this application set would be for the instructor or preceptor to purchase each application as it is covered in class, exposing the students to the resource and allowing the student to decide whether to purchase it (either now or later as a clinician). The applications are affordable and a worthwhile purchase for athletic training faculty, students, and preceptors.

The C.O.R.E and 3D4Medical applications are effective, as they eliminate the need for real-time illustrations created by the instructor (thereby saving time in the classroom) and may improve overall student engagement in the classroom, as they are often amazed at what the application can illustrate. Notations on iPad screen, as well as description pins that appear at the touch of a button, make this application an excellent tool for patient education. Possibly most important, the application serves as a resource for students outside the classroom when the instructor is not available. The series is available for both iPhone and iPad devices, and for students, 3D4Medical offers a quizzing application to assist with evaluation of learned material. An example of the shoulder application is included in Figure 3; however, many others are available in the iTunes store, including, but not limited to, all joints in the body (including spine and back), central and peripheral nervous systems, muscle and skeletal systems, and patient education tutorials.

While many tablets have come on the market, Apple remains the leader in educational technology, offering over 10000 apps in the Education App store (https://itunes.apple.com/ WebObjects/MZStore.woa/wa/viewRoom?fcId=409416547& mt=2&genreIdString=12003&mediaTypeString=Desktop+ Apps). There are other useful applications that can be found in the App Store to facilitate learning in the athletic training classroom (eg, anatomy, physiology, rehabilitation); however, there are no others that offer the comprehensive approach to EBP that C.O.R.E. does. Educators may wish to create such applications on their own or by seeking assistance from their university's information technology staff.

It is worth mentioning that with the latest technology available in the classroom, students may find themselves caught in the middle between EBP techniques taught in class and clinical practice occurring at their clinical site. Part of the role of the athletic training program (ATP) is to educate both students and preceptors so that what is taught in the classroom carries into and is reinforced in the clinical setting. Annual preceptor trainings can be held to educate preceptors on EBP techniques and to connect them to our classrooms. While preceptors often do not have an active role in our ATP classrooms, they can be connected through iPads, applications, and push notifications, which allow ATP directors and faculty to deliver to them the same information that is delivered in the classroom. This dual focus, didactic and clinical, allows students to be immersed in the EBP focus across the curriculum.

In summary, the applications highlighted are just a few examples of effective use of technology in the athletic training classroom and of extension of learning to the preceptor and the clinical site. In implementing this technology in your classroom, other essential hardware is suggested so that faculty can project from the computer-based smart classroom tabletop to the class from the device. A lightening-to-VGA adapter or the 30-pin-to-VGA adapter for older iPad models (http://store.apple.com/us/product/MD825ZM/A/lightningto-vga-adapter?fnode=3a) will handle this, and these devices are available from the Apple store. A stand for the iPad or a case that folds into a stand for placement on the tabletop aids in convenience. A stylus pen for notations on screen is useful. but not essential. If projecting from the podium, students can come up and write on screen while projecting to the class. In another model, each student has an iPad and can wirelessly project to the classroom screen with his answer or information (almost as if he is "lecturing" from his seat in the class). This



**Evaluation of the Wrist: Establishing Differential Diagnoses** 



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can be achieved via Apple TV (http://store.apple.com/us/ browse/home/shop\_ipod/family/apple\_tv) or via Doceri software (http://doceri.com/features.php) and an air-play application. With technology evolving at lightning speed and students becoming more and more technologically savvy, it can be a challenge to keep up in the classroom. With all the information available at one's fingertips, students are, and Figure 3. NOVA shoulder quizzing application (http://itunes. apple.com/us/app/shoulder-pro-iii-animations/id491305514? mt=8). Logo reprinted with permission.



should be, challenging the ways things have been done and asking the "why" behind the techniques. Finding ways to

embrace technology in the classroom serves to engage students at a higher level and allows the student to take on the role of the clinician, piecing together the existing evidence and making an informed decision based on sound EBP. Putting in a little work now to bring these EBP and evaluation resources into the athletic training classroom will prepare students as functioning clinicians of tomorrow.

## REFERENCE

 National Athletic Trainers' Association. *Athletic Training Education Competencies*. 5th ed. Dallas, TX: National Athletic Trainers' Association; 2011.