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Video Analysis of Athletic Training Student Performance: Changing Educational Competency into Clinical Proficiency

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Context: Assessing clinical proficiency and documenting learning over time is quite challenging. Educators must look for unique ways to effectively examine students' performance and archive evidence of their academic progress.

Objective: To discuss the use of video analysis to bridge the gap from educational competency to clinical proficiency, and describe its use in the assessment of clinical proficiency of the athletic training student

Background: A consistent challenge in curricular development for any athletic training education program (ATEP) is transforming formal classroom and psychomotor skill learning to the appropriate clinical proficiencies required by the standards for accreditation. Thus, we developed a method to address this challenge that incorporates the use of digital video technology.

Description: We describe the use of video in the form of a digital video disc (DVD) as the means to evaluate and assess the student's achievement of specific clinical proficiencies. Additionally, we give specific examples of the aspects of video analysis that we have addressed in actual encounters. We present this method as a means to perpetuate the concept of "learning over time."

Clinical Advantage(s): The use of video to analyze student performance during a clinical injury evaluation provides the means of (1) evaluating an athletic training student's clinical proficiency, (2) allowing student input into their psychomotor performance, and (3) developing archival data of student performance for re-evaluation and documentation of learning over time.

Conclusion(s): The use of video analysis represents an effective pedagogical method to educate athletic training students.

Key Words: pedagogy; learning over time; clinical education, DVD

According to the Standards for the Accreditation of Entry-Level Athletic Training Education Programs published by the Commission on Accreditation of Athletic Training Education (CAATE), "the content of the curriculum must include formal instruction in the expanded subject matter as identified in the Athletic Training Educational Competencies." [1(pp9-10)] The standards also require that didactic instruction include required subject matter with emphasis in structured classroom and laboratory experiences. Additionally the standards dictate that the clinical education plan follow and reinforce the sequence of formal classroom and psychomotor skill learning.[1] In other words, the goal of clinical education is to develop and assess clinical proficiency based upon didactic instruction.

An example illustrating the definition of psychomotor skill development and clinical proficiency was described by Knight[2] who discussed the difference between the performance of simple diagnostic tests such as an ankle drawer test and a complex activity such as evaluating the ankle of a patient with unknown pathology. In other words, when demonstrating a descriptive clinical proficiency during a clinical injury evaluation, the student must analyze the problem, consider their findings, and make decisions about which tests are—and which tests are not—applicable. For example, a student who performs each and every test during an actual shoulder evaluation, sometimes referred to as the "shotgun approach," is not displaying the ability to discriminate between appropriate or inappropriate tests. Educators charged with fostering critical appraisal and decision making must mentor the student to move past the shotgun approach and demonstrate clinical competence.

The application of these formal standards and guidelines can be a frequent challenge for both the academic and clinical staff of an athletic training education program (ATEP). During the transition from classroom to clinic, students must transform didactic knowledge into clinical reasoning. Using an injury evaluation as an example, the student's ability to perform all the individual components of an evaluation (ie, observations, palpations, active or passive range of motion, manual muscle tests, and special tests) does not infer their ability to perform a comprehensive injury evaluation. More importantly, the ability to perform individual skills does not indicate the ability to interpret the results of the evaluation and arrive at the appropriate assessment. At the heart of this understanding is the differentiation between athletic training educational competencies and clinical proficiencies. Thus, our purpose is to describe the method we employ to take advantage of video to assist in the education of undergraduate athletic training students in an attempt to bridge the gap from educational competency to clinical proficiency.

We searched an electronic database of various pedagogical methods used by healthcare professions to promote clinical thinking. In the

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description of their methods, a number of advantages with video analysis were discussed.[3-9] The efforts of these programs are consistent with Georgetown University's Visible Knowledge Project, which describes the use of videos as a means to get the students to talk about what they are learning and relate it to past experiences.[10]

Methods

Over the last few years, we strived to develop a curriculum that would enhance the transition from a set of didactically taught clinical skills to practically performed clinical proficiencies. The emphasis of this task was to enhance the ability of the athletic training student to perform an effective injury evaluation. Inherent in this task was the ability to not only perform the individual test and measures, but also to analyze the results, develop a differential diagnosis, and devise a plan to treat the patient. In our program, we have implemented a developmentally appropriate sequencing of courses with outcome measures for each task (Table 1).

During the first year of the program, we teach the students conceptual aspects of a clinical evaluation. For example, when conceptually discussing a range of motion assessment, we teach the students about the parts of a goniometer and how to align it to specific anatomical landmarks. In the manual assessment of muscle strength, we instruct the students on the appropriate grading scales and the difference between a "make" and "break" test.[11(p19)] In the students' second year they enroll in a series of courses entitled Orthopedic Evaluation I and II. During the initial stages of these courses, we teach the students how to apply the foundational concepts and constructs of the clinical evaluation to specific joint evaluations. For example, we instruct the students on how to apply the goniometric concepts to range of motion measurements of shoulder flexion and knee extension, or how to grade the strength of the knee flexors and extensors. The emphasis in the first course is on injuries to the lower quadrant, while in the second quarter, the emphasis is on the upper quadrant. During both of these courses, we assess the students through practical exams during which the students serve as models for other students.

Throughout the last quarter of their junior year, we provide the students with opportunities to apply these skills to the evaluation of patients with specific musculoskeletal pathologies as a part of their structured academic education, which is in addition to the patients they encounter as a part of their clinical education. The fact that the patients have actual pathologies adds an immeasurable component of realism to the encounter. In the words of famed educational reformer, John Dewey, "…there is an intimate and necessary relation between the process of actual experience and education." [12(p17)] Also during these experiences, we digitally record the students' performance to use as an outcome assessment tool.

During the clinical education component of their senior year, the students' approved clinical instructor (ACI) continues to supervise the application of their psychomotor skills and attainment of clinical proficiencies. We periodically use video during this period to provide a comparison to previous experiences.

Video Recordings

As previously mentioned, the use of video recordings to demonstrate clinical skills is an established practice for a number of professions.[3-9] Of more importance is that students value the process of the video

Table 1. Example of curriculum for developing the athletic training student's ability to perform an injury evaluation with an emphasis on "learning over time"

Student Level in ATEP	Student Task	Outcome	Assessment Tool
Fall quarter of sophomore year	Instruction in evaluation concepts	Practical exams in performance of specific subjective and objective evaluation concepts performed on non-injured volunteers	Instructor's direct observation
Fall quarter of junior year	Instruction in specific lower quadrant evaluations	Practical exams in the performance of injury evaluations in the lower quadrant; patient scenarios with classmates	Instructor's direct observation
Winter quarter of junior year	Instruction in specific upper quadrant evaluations	Practical exams in the performance of injury evaluations in the upper quadrant: patient scenarios with classmates	Instructor's direct observation
Spring quarter of the junior year	Patient evaluations	Practical exams in the performance of injury evaluations in the upper / lower quadrant: patient scenarios with actual patients with real pathologies	Video recording
Senior year	Practical applications of actual patient evaluations with injured athletes	Periodic video analysis of student performance	Video recording

Table 2. "Ground rules" for performance of recorded patient evaluations

1.	The specific area to be evaluated and pathology are not always known by the student
2.	The students are allowed to bring any type of evaluation form on which to record their subjective and objective findings
3.	The student must provide any specific evaluation tools they feel may be necessary during the evaluation (i.e., goniometer, reflex hammer, tape measure, etc.)
4.	The student and patient are assured that the video will only be viewed by the assigned athletic training student and their professor
5.	The student must assume a professional demeanor at all times—appropriate dress and professional behavior
6.	Evaluation must proceed unimpeded
7.	The patients are instructed not to "play act" any of their responses

recordings for its ability to provide self-observations, peer critique, and tutor feedback.[5-6] The video process we utilize is standardized, such that the student begins with a general understanding and defined set of expectations. We have listed in Table 2 the basic understanding and instructions given to the student. When using video recordings to assess the student's performance of the clinical evaluation, it is important that they follow the typical evaluation format (ie, history, observation, palpation and stress [HOPS])

Additionally, we feel that careful consideration of the characteristics of the encounter adds to the perceived realism. Thus, during the entire process of the evaluation, the student is required to maintain a professional demeanor in all aspects. This is reflected in the student's dress and behavior. If possible, the student knows neither the patient nor the pathology. In our experience, if we allow the students to evaluate their friends or classmates, the level of comfort may detract from the learning experience. Thus, with the use of standardized patients (ie, the patients are acting out a specific pathology), the responses are not always appropriate and must adhere to a "typical presentation".

Subjective Evaluation

During the subjective evaluation, the students may question the patient in any manner they deem appropriate. We instruct the students in general and joint-specific questions. We also encourage the students to develop a subjective assessment form that they may bring to the evaluation. At the completion of the subjective evaluation, we encourage the students to develop a list of possible pathologies (eg, differential diagnosis). We further instruct the students that this differential diagnosis is what drives the direction of the subsequent objective evaluation.

Objective Evaluation

Throughout the objective evaluation, we allow the athletic training student to proceed in any manner they deem appropriate even though we provide them with a standard template with which to precede. In an attempt to make this experience as authentic as possible, we encourage the students to develop and use an appropriate objective assessment form.

Prior to participating in this experience, we instruct and encourage the students to begin with either an upper or lower quadrant scan exam. The purpose of this exam is to examine all appropriate tissues and determine if the nature of the patient's subjective complaints are consistent with the previously determined differential diagnosis.[13] Throughout this process the students employ the psychomotor skills that were a part of the classroom discussions and lab activities. These steps may have included gross and specific observations and palpations, goniometric measurements to assess quantity of motion with active and passive motion assessments, manual muscle testing for both group and specific muscles as appropriate, and joint-specific special tests.

Documentation

Prior to the evaluation, we give the student both classroom instruction and a template to follow. At the completion of the evaluation, we give the student 24 hours to document their findings. The student will determine the appropriate assessment, problem list, long and short term goals, and plan to achieve set goals.

Review of the Video

Following the submission of the appropriate evaluation documentation, we give the student a copy of the video (in the form of a DVD) for the purpose of self-analysis. Paul et al[6] in a discussion of using video when educating medical students specializing in pediatrics stated that the review of video recordings allowed the student to gain an understanding of their strengths and weaknesses, which provides a realistic self-awareness of performance and a motivation to improve knowledge and skill.

The athletic training student and the instructor then meet to discuss the entire process. It is during this exchange that the review of the video becomes the most useful. In our experience, by allowing the clinical evaluation to proceed unimpeded, the supervising clinician cannot make specific corrections to the student's technique; however, what is gained is immeasurable. By being a part of the analysis process, the student is able to provide input into the interpretation of the video. This aspect provides the ability to understand the perspectives of the student and to discuss their critical-thinking process. This experience was described in part by Parker and Pitney.[14] In an attempt to facilitate the development of reflective practices among athletic training students, the authors described how simulated recall was promoted through video analysis. The authors felt that this method allowed the students to "think aloud and process the decisions they made during their interactions with students."[14(p47)]

Analysis and Review

Subjective Evaluation

During the discussion of the subjective evaluation, the student and instructor are able to analyze the entire process for completeness and flow. In other words, did the line of questioning follow a logical pattern? Did the patient clearly understand the intent of the student's questions?

By reviewing the video, the student can appreciate the importance of professionalism and the need for appropriate and clear communication.

This process can make the athletic training student aware of common mistakes such as the inappropriate use of medical terminology. In our experience, athletic training students initially have a tendency to phrase their questions as instructed rather than in a conversational tone. For example, students will ask for the motions and positions that aggravate or alleviate the patient's symptoms rather than say, "tell me what makes the pain worse or better." Additionally, the student can appreciate the variation in response to both open- and closed-ended questions. Our students are instructed to begin with open-ended questions and then transition to close-ended questions as they begin to narrow their focus. Our belief is that this ability is an indication of the student's critical thinking.

Another area of difficulty for the student is understanding the meaning of specific descriptors for the nature of a patient's symptoms. In most entry-level athletic training textbooks, the various descriptors of a patient's symptoms are associated with specific pathological conditions. For example, the correlation of burning or shooting pain with radicular symptoms.[13] By evaluating patients with actual pathologies, the student is able to appreciate the individualistic description of a patient's symptoms. Additionally, the student is able to appreciate their chosen method of asking for subjective ratings of pain and understand the value of using a consistent rating scale.

Objective Evaluation

In reviewing the objective portion of the evaluation, the student and their instructor can again assess the overall form and format of the student's performance. The student can determine if the order used in the objective evaluation made sense based on the differential diagnosis determined after the subjective evaluation. In other words, the differential diagnosis drives the objective evaluation and the selection of specific tests and measures. Additionally, the student and their instructor can discuss errors common among novice clinicians. For example, the student can assess the number of times they asked the patient to change position. In most circumstances, excessive movement may exacerbate the patient's symptoms.

When asking the patient to perform specific motions or get into specific positions, the student is usually forced to describe specific characteristics of the pathological process in lay terms. In other words, as instructors we constantly remind our students to avoid using medically appropriate terms such as trunk flexion and lateral flexion. However, the issue becomes much more understandable when the student is faced with a patient who looks at them with a sense of bewilderment when they could simply have been told to bend over and try to touch the ground or reach down the outside of their leg as far as they can without pain. Without the use of the video, the instructor would have to stop the evaluation to correct the student or risk not being able to describe this specific situation to the student.

In terms of the objective evaluation, most inexperienced students tend to employ a shotgun approach to the evaluation, which means they perform as many tests as they remember in hopes of stumbling upon a positive finding. By reviewing the videotape, the instructor is able to refocus the student's attention to their initial differential diagnosis and discuss how this should form the framework for subsequent objective tests.

Clinical Reasoning

In our experience the ability to use video to demonstrate the link between the subjective and objective evaluation cannot be understated. By allowing the student to formulate a differential diagnosis, the student can begin to see its role in the design of the objective evaluation. An additional benefit is to give examples of how specific subjective responses should correspond to either including or excluding certain objective tests. For example, in an actual encounter with a patient with a shoulder injury, the patient stated that their symptoms were aggravated while "doing push-ups" or while "resting on their elbows". The video allowed a discussion of the commonality among these activities (eg, glenohumeral compression) and the need to test the shoulder for a possible labral tear. The common term applied to this practice is critical reasoning. Geisler and Lazenby[15] discussed the challenge of instilling the ability to think critically. They discussed the importance of teaching critical thinking to athletic training students but acknowledged the lack of structure for doing so.

In another encounter the patient described how her symptoms in the lumbar region were aggravated when lying prone. However, during the course of this objective evaluation, the athletic training student asked the patient to assume the prone position. Immediately the patient had increased complaints of pain. The video allowed the student to review this evaluation and appreciate the importance of listening to everything the patient reported and adapting their objective evaluation accordingly.

Another aspect of the clinical evaluation that students often overlook is the need to place emphasis on the patient. The video analysis allows a review of the importance in assessing the patient with a shoulder or knee injury rather than the proficiency to evaluate the shoulder or knee. The video allows the student and their instructor to discuss the phrasing of the questions during the subjective evaluation. For example, if the patient is a child, the student should direct the questions to the patient as much as possible even if the parent or guardian is present. In another example, if the athletic training student is evaluating another health care professional, the use of more medically-driven terminology may be appropriate.

The video also provides a lasting record of past student performance and a means to document the concept of learning over time. These visual records of the student's performance can be compared to more recent experiences so that specific and generalized changes can be assessed.

Additional Advantages

The use of video allows for input on the athletic training student's performance by a number of academic and clinical staff. This ensures that there is consistency in grading across the students. Davies et al[7] noted that when the physiotherapy students had copies of their video clips they could replay the clips as frequently as they wanted in their own time and pace. Additional advantages include providing a lasting record to compare past and present performance.

Disadvantages

In spite of the obvious advantages to the use of video recordings, there are also some disadvantages. The most obvious is the equipment costs. The cost for a digital recording device can range from a few hundred dollars to thousands of dollars for more sophisticated devices. Additional costs are incurred depending on the uses for the recordings. Editing and conversion of the videos to DVDs for the student require the use of a computer with the appropriate software. Depending on the sophistication of the software, this expense could also exceed a few hundred dollars.

Another concern is the labor intensive requirements of this process. The clinical evaluation is obviously performed and recorded in real time. The ability to convert the original recording to a reviewable format is dependent upon the equipment. In our current process, we convert digital recordings in real-time to DVDs that are reviewed by the instructor and compared with written documentation. The athletic training student then reviews the recording prior to consultation with the instructor. The entire process for a single 30 minute evaluation may require up to 2 hours to adequately review with the student.

In our present format additional time is required for patient recruitment and scheduling. However, as noted previously, the advantage provided with the use of real-world patients cannot be understated.

Conclusion

While the use of video to assess the performance of the athletic training student may not be new, we have learned much during the many hours we have put into the process. The use of video analysis of student performance during a clinical injury evaluation provides a means of (1) evaluating an athletic training student's clinical proficiency, (2) allowing student input into their psychomotor performance, and (3) developing archival data of student performance for re-evaluation and documentation of learning over time. It is also important to continually review and redefine the concepts of clinical proficiency and clinical reasoning. The use of video allows for a daily means of achieving this task.

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