Wiimote Viewer Enhances Resident Case Conferences

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THE PROBLEM

The educational benefits of simulation environments and interactive systems have been well described. A systematic review of virtual reality laparoscopic surgery training of surgical residents demonstrated improved accuracy, speed, and reduced numbers of errors [1]. Audience response clickers have gained wide praise for increasing audience perception of engagement with lecture content, course participation, interest in presented material, and information retention [2]. Similarly, interactive 3-D tools are replacing static 2-D anatomy teaching products [3]. Students prefer interactive education to more traditional static lecture formats [4].

One of the most interactive systems available is the Nintendo Wii video game system (Nintendo Corporation, Kyoto, Japan) [5]. This system employs a novel user interface system reliant on a specially developed Wii remote control (Wiimote). Using 3-D accelerometers, the Wiimote detects motion and wirelessly transmits data via the Bluetooth communications protocol to the base unit. The enhanced level of interaction between users and games has created an explosion in the marketplace [6].

Health sciences have also recognized the potential of the Wiimote as a tool. Rehabilitation medicine has successfully used the Wiimote for rehabilitation of an adolescent with cerebral palsy [7] and as a 3-D tool for physiotherapy [8]. Pediatric medicine has promoted the potential health benefits of the increased energy expenditure required to interact with Wii [9].

Despite this evidence, radiology resident case conferences rarely use interactive tools. Arguably, resident case conferences have become less interactive in the age of computer-based lectures. Film-based teaching was more interactive, with residents touching, moving, and magnifying films. Computer-based resident case conferences (eg, PowerPoint presentations [Microsoft Corporation, Redmond, Washington]) are often reliant on static select images displayed on a screen, known as select images case conferences (SICCs). Single images offer limited information compared with an entire series of cross-sectional images. Furthermore, there is no interaction between the resident interpreting a case and the images. A SICC only marginally simulates daily radiology work.

OUR SOLUTION

We have developed a novel teaching device using the Wiimote. The interactive system allows a resident to take a case wirelessly (within 10m) and control an entire cross-sectional study. The purpose of this study was to evaluate the perceived educational benefits of our tool.

A customized Digital Imaging and Communications in Medicine viewer was implemented to interface with the Nintendo Wiimote (Figure 1), which we named the Wiimote Viewer (WMV). The WMV can be installed on any laptop running the Windows operating system (Microsoft Corporation).

Lecturers selected cases to be presented. The studies were then anonymized and exported from our institution's PACS and loaded into the Teaching Worklist of WMV (Figure 2A).

The resident using the Wiimote selects the case from the Teaching Worklist (Figure 2A) and the series within the case (Figure 2B) and may proceed to scroll through the entire cross-sectional study by slightly tilting the controller clockwise or counterclockwise and squeezing the trigger (B button; Figures 2C and 2D). The number button 1 allows the resident to cycle through the different window and level presets that are defined in a configuration file (eg, body, neurologic, or manual window and level options). The number button 2 allows the resident to cycle through the different series within a study. Once the case has been completed, the resident then returns to the Teaching Worklist (home button) and passes the Wiimote to the next resident, and the conference continues.

The residents at our institution were administered a survey before and after 5 case conferences using the WMV. The attending radiologists were also surveyed after the conferences they presented.

OUTCOMES AND IMPLICATIONS

Five 50-minute resident case conferences were held using the WMV. The sections giving conferences in-

Fig 1. The Nintendo Wiimote.

cluded body (2 conferences), neuroradiology, emergency radiology, and chest radiology.

Thirty-two residents were surveyed with an anonymous online questionnaire using a 3-point, Likert-type scale ("agree," "neutral," and "disagree"). Response rates were 69% and 40% before and after WMV conferences, respectively (see Figures 3-5 for details).

Resident and attending radiologists at our institution immediately recognized a potential application for the WMV in preparing junior residents for call situations. In small-group settings, junior residents can practice approaching an entire case with the benefit of guidance. A more experienced radiologist can assist a trainee in how to approach a study efficiently and to minimize errors in perception. In resident case conferences, junior residents also benefit by learning how senior residents approach an entire case, not just how the senior residents synthesize findings to formulate a differential diagnosis.

Allowing residents to view an entire study also teaches them to use secondary signs to "home in" on pathology (eg, inflammatory changes in periappendiceal fat in a case of appendicitis). Once the initial diagnosis is made, the resident then has the ability to search the case for potential causes (eg, appendicolith) and common diagnosis-related complications (eg, periappendiceal abscess).

In addition, scrolling through a case allows for evaluation of pathology best viewed across multiple im-
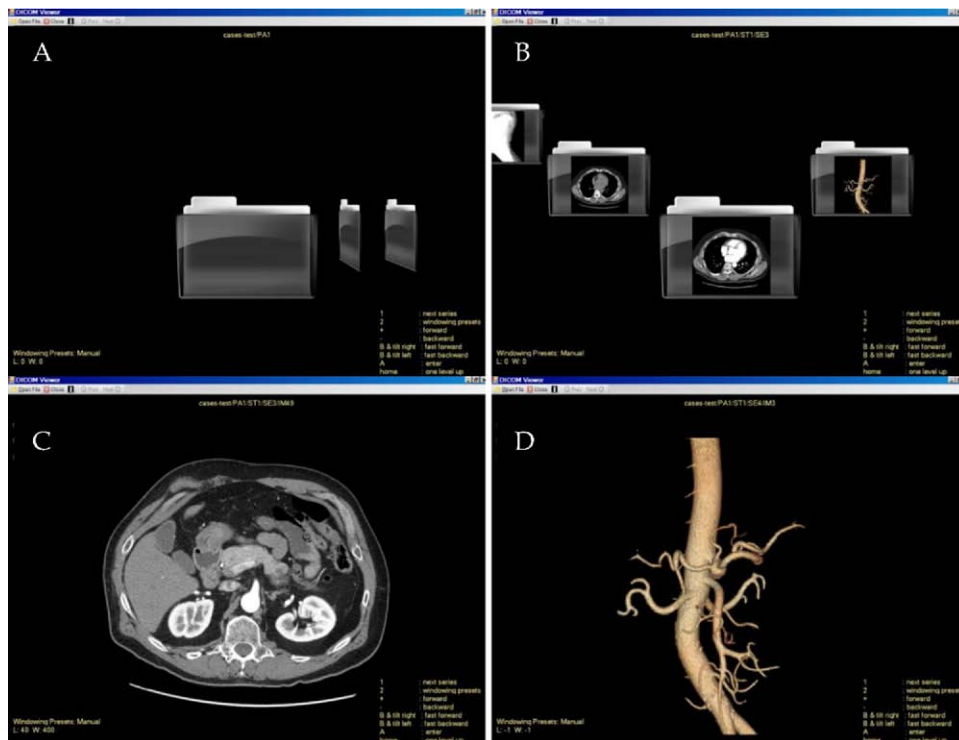

Fig 2. Screen captures from the Wiimote Viewer. The initial screen is the Teaching Worklist file tree (A). Tilting the Wiimote left or right while pulling the trigger (B button) allows the user to select a teaching case. Once the case is selected, available series for that study are displayed (B). Tilting the Wiimote left or right while pulling the trigger allows the user to select the series from this screen (B). Selecting the series allows the user to then scroll through individual images by slightly tilting Wiimote left or right while pulling the trigger (C,D). Pressing the home button returns the user to the prior screen.
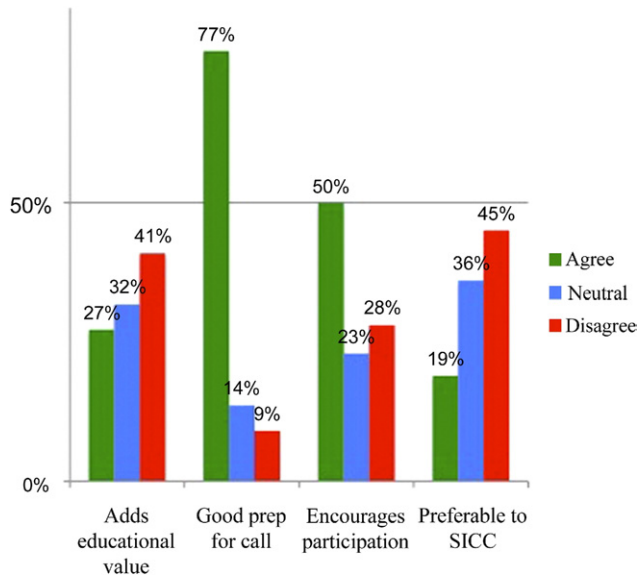
Fig 3. Summary of resident survey results before a Wiimote Viewer conference demonstrating that residents were split as to whether the Wiimote would add educational value to case conference. Residents felt that it would be useful to prepare residents for call and would encourage conference participation. Residents did not anticipate the tool would be preferable to a select images case conference.
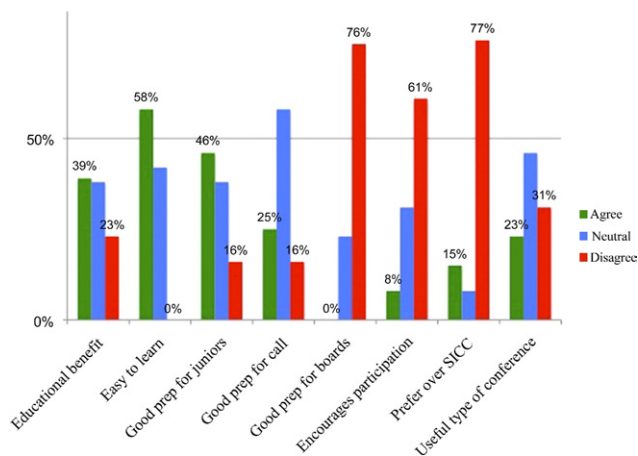

Fig 4. Summary of resident survey results after a Wiimote Viewer (WMV) conference demonstrating that the WMV added educational value over a select images case conference was easy to learn and prepared junior residents for daily work and call situations. The residents did not find the WMV conference to be good preparation for oral boards, to encourage participation, or to be preferable to a select images case conference (SICC).

ages. For example, in routine work, radiologists "run the bowel" to make diagnoses. In contradistinc-tion to a SICC, a WMV conference allows residents to clearly delineate if a bowel-related lesion is intralu-minal, intramural, or extraintesti-nal.

Attending radiologists providing conferences also appreciated the unique opportunity afforded by the WMV. Our staff unanimously re-ported that the WMV augmented the educational value of resident conferences. Curricula are widely available for educators to teach the cognitive skills required in radiol-ogy. However, the ability to guide a resident to findings during a con-ference facilitates lecturers to teach perception skills.

Interpretive errors in radiology can be categorized as perceptual or cognitive [10]. Perceptual er-rors are those in which a radiolo-gist fails to recognize a finding, and cognitive errors are those in which a radiologist incorrectly synthesizes information. A SICC trains the cognitive process: how to synthesize a case once the find-ings are already made. We recog-nize the merits of this type of learning, and certainly the oral ra-diology boards are currently set to test the cognitive skills of a radi-ologist. However, few tools exist to teach perception. What we have developed is a training tool that may decrease perceptual er-rors by more accurately simulat-ing the daily work of a radiologist.

The decision to design an image viewer on the basis of the Wiimote was multifactorial. Exceptional tech-nology is bundled into the light-weight handheld device, including accelerometers in 3 dimensions, in-ternal Bluetooth communications, and an infrared camera. We also surmised that the prevalence of the Wii video game console would make the teaching device more intuitive to use than an in-ternally developed device. Most important, the Wiimote is widely available, even internationally.
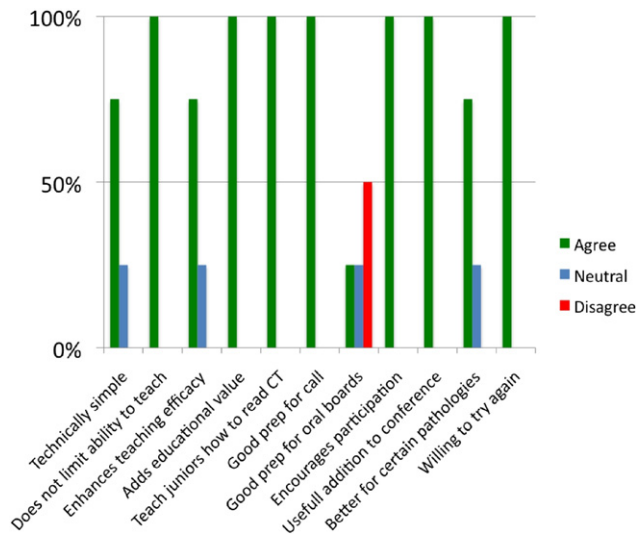
Because the Wiimote is widely

Fig 5. Summary of attending radiologists at our institution after preparing and providing resident case conferences using the Wiimote Viewer (WMV). Attending radiologists unanimously found the tool to be technically simple and to have a positive effect on their teaching and were willing to use the WMV again. Half did not feel that the WMV was beneficial for oral board preparation.

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available, and Bluetooth standards allow for easy connection with any laptop, the WMV software is being released to any institution interested in implementing this educational tool.

In summary, the WMV is a widely available, fully portable, novel tool for improving radiology resident case conferences by pairing an inexpensive handheld device with our freely available software. Functionality includes scrolling through images, changing window and level presets, and changing series wirelessly within 10m of the base station. The WMV facilitates viewing an entire study in a conference, simulating daily radiology work, with the intent to decrease errors in perception. Residents found WMV conferences to be particularly beneficial for junior residents and as preparation for call situations. Attending radiologists also found the WMV to be a valuable addition to conferences. Both groups found the WMV to be intuitive to use and easy to learn. Residents and attending radiologists felt that the WMV added educational value to conference.

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