MOTION CAPTURE FOR TELEMEDICINE: A REVIEW OF NINTENDO WII®, MICROSOFT KINECT®, AND PLAYSTATION MOVE®

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Abstract

Access to healthcare has been and continues to be difficult for many around the world. With the introduction of telemedicine, this impediment to attaining medical care has been lifted. Although many avenues of telemedicine exist (and have yet to exist), the use of home video game consoles such as the Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® can be used to measure patient progress outside of the office. Due to the nature of each individual console/system, some unique characteristics exist that allow each system to provide its own clinical potential. A comparative analysis of the clinical implications of the Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® showed that with its ease of use and dynamic accuracy, the Microsoft Kinect® offered the most benefit. With further exploration, using the Microsoft Kinect® for telemedicine will be able to improve medical efficiency and hopefully health outcomes.

Keywords: telemedicine; telehealth, medical care; motion capture, eHealth; mobile health

Introduction

Technology has been integrated into nearly every aspect of human livelihood in the 21st century. Some consider this emergence of technology a mixed blessing, though it is widely agreed that it has positively helped the healthcare system in many ways. These innovations in medicine are having a lasting effect on the way healthcare is delivered. Specifically, with the emergence of telemedicine, access to healthcare can be almost instant. The Institute of Medicine defined telemedicine as the "use of electronic information and communication technologies to provide and support healthcare when distance separates the participants."[1] With the advances of the Internet, society has become more connected than it has ever been before, especially in the medical field. Physicians, nurse practitioners, physical therapists, etc. can now manage, consult, educate, monitor, and support patients outside of the traditional office setting. To illustrate, Dasgupta et al. highlighted that the Indian Space Research Organisation (ISRO) telemedicine network in India allowed physicians to reach remote locations, depleted of healthcare workers.[2] Although this form of technology is on the rise in medicine, many advances toward use of this service have and continue to emerge.

Motion capture has been used to revolutionise patient and physician interaction in telemedicine. Motion capture, also known as MoCap, is a method of movement analysis to record useful data. Various investigators have used this form of technology for medical applications. For instance, Fitzgerald et al. provided patients with a wearable body suit with motion tracking sensors to monitor activity during various exercise programmes.[3] With these data, providers have the ability to review patient progress and alter the programme to best suit the patient. Pan et al., developed an at home monitoring system to assess patients with Parkinson's disease using a smartphone 3D accelerometer and mobile cloud-based technology.[4] This not only provided information on the progress of these patients, but also it limited the burden of having to come to the office regularly for check-ups.

One opportunity to use motion capture is through the use of video game consoles to monitor patient progress at home. For instance, follow-up service can be just a simple range of motion exercise in front of a TV through the use of a console. With many consoles available, research exists that shows benefits of individual software systems. Consequently, an assessment of the clinical implications of three main video game consoles, the Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® was undertaken. This paper presents the assessment and includes a concise overview of each console, its benefits/limitations, and future clinical applications moving forward.

Methods

Hands-on Approach
With each system providing unique characteristics, many routes of medical analysis can be done using each console. The ultimate goal of this assessment was to determine which console was the most clinically applicable for motion capture in telemedicine. The foundation of this assessment was through investigation of the characteristics of each system through manual use of the consoles, as well as hands-on work with applicable software. First-hand experience with software included *iPi Soft*.[5] This applied approach to both the consoles and subsequent software programme allowed for descriptions of each individual system, their benefits and limitations as a foundation for potential applications.

Literature review
A literature review of current research on Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® was undertaken using the electronic databases, PubMed (2017-2018) and Google Scholar (2017-2018). The principal search strategy used were searches of "Wii", "Kinect", and "PlayStation Move". These results yielded 737, 797, and 5 papers that mentioned each term, respectfully (PubMed). This was opposed to Google Scholar, which mentioned "Wii" in 260,000 papers, "Kinect" in 125,000 papers, and "PlayStation Move" in 28,100 papers. To account for false positives in search results, some additional search criteria was provided in PubMed. Searching both "Nintendo" AND "Wii" provided 418 papers; "Microsoft" AND "Kinect" provided 376 papers.

To refine such results of each console towards clinical technology use, filters were applied to each search. For the Nintendo Wii®, search was limited to the title and abstract using 'Wii" AND "Rehabilitation", which produced 183 publications; "Kinect" and "Rehabilitation" had 162 publications; "PlayStation Move" and "Rehabilitation" had 2 publications. Additionally, another search was limited to the title and abstract using "Telemedicine" AND "Policy" for discussion later on telemedicine policy initiatives and standards (which yielded 300 articles). This final search filtered dates from 2016-2018 for more recent updates to policy to 102 publications.

Criteria
Criteria for such searches needed to reasonably fit the question of which console provided the most benefit clinically for telemedicine applications. As mentioned previously, only the Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® were assessed for clinical use. Specifically, these three systems were studied due to their clinical compatible technology. Additionally, dates of publications from 2011-2018 were also assessed due to the most recent and relevant advances in telemedicine. Furthermore, study design of cross-sectional studies, case-control, and cohort studies were assessed in each paper reviewed. These designs allowed one to further analyse the approach to such analysis by each researcher. Lastly, participants mostly included disabled patients to show the therapeutic effect of each subsequent investigation, ultimately leading to distinguishing superiority amongst the consoles.

Results

Assessment of the Nintendo Wii®
The Nintendo Wii® was one of the first commercially available interactive consoles. In competition with the somewhat "limited" targeted audience of the Xbox® and PlayStation® at its time of inception (2006), the Wii® had a more broad demographic. This was mostly due to the nature of the console being easy to learn and use. The Nintendo Wii® is able to track spatial movements through sensors between the console/sensor bar and handheld controllers to feature into game play.[6]

Wii Fit® was introduced in 2008, two years after the introduction of the Nintendo Wii® console, as an initiative to provide fitness into the video game arena. According to the official Nintendo website, one can "control on-screen action with your movements on the balance board as you work your way through a variety of challenges aimed at getting you off the couch and into the action."[7] With the Wii Balance Board®, it can "read your real-life movements and bring them to life on screen, just like the Wii Remote controller."[7]

Nintendo Wii® advantages vs. limitations for motion capture

The very distinctive characteristic of the Wii Fit® programme is the Wii Balance Board®. The consumer steps on the board; feedback about the movement patterns is then transmitted using pressure sensors and wireless technology. Thus, through the use of the balance board and controller, strength training (such as lunges and push-ups), balance training, aerobics, and other exercise possibilities such as yoga can be accomplished.[8]

Four sensors in the board send information to a sensor bar that processes data to the console. In a study by Chang et al., DarwiinRemote software displayed and analysed real-time sensor signals from the board to evaluate the balance status of the elderly.[9] The study found that the balance board had good reliability and validity for assessing elderly patients. Abujaber et al. used the balance board to analyse patients with unilateral lower limb musculoskeletal pathologies and found that the Wii Balance Board® served as a low-cost alternative to measure asymmetry in clinical settings.[10]

There are many other studies on the effectiveness of balance training with the Wii Balance Board®. Research has proven that the board can be a successful substitute for other training programmes. However, little clinical research was performed outside the balance aspect of the Wii® system, and those performed were not successful. A study by Punt et al. examined the Wii Fit® for exercise therapy in the rehabilitation of ankle sprains.[11] An experimental group using the Wii Fit® with physical therapy and a control group using the Wii Fit® with no exercise therapy were compared. The use of Wii Fit® with physical therapy was not more effective than the control.

Nintendo Wii®: potential clinical applications requiring motion capture

The Nintendo Wii Fit® has been revolutionary since its development in the video game industry. The ability to use different motions through its controllers and balance board allow the user to explore many options. Although the Wii® console is known for its hand-held controllers, clinically balance has been found to be the more unique factor of the Nintendo Wii® system.

Many people with Parkinson's disease, post surgery, stroke patients, etc. can benefit from this inexpensive balance training. For instance, Plow et al. showed an improvement in balance and other fitness factors such as mobility, strength, and weight using Wii Fit® with multiple sclerosis patients.[8] These patients can develop a sense of better proprioception through repetitive learning using such an interactive and fun device.

There is lack of research on the Wii Fit® programme or Wii Sport® game (which mimics bowling, baseball, etc. through the users' motion) on applications other than balance: such as upper body and limb motion, which would be appropriate to investigate. Other systems, such as the PlayStation Move®, have had research conducted on controller integration in analysing range of motion and even improvement of symptoms. Also, exclusive to the Nintendo Wii®, are the dual controllers (main controller and Nunchuck), which analyse both of the operators' hands. Using the controllers can be key and very useful in prospective studies.

Assessment of the Microsoft Kinect®

Microsoft Kinect® was introduced to compete with the Nintendo Wii's interactive style. It was originally built for the Microsoft Xbox 360® game console. Later, Kinect® was compatible with Windows PC® allowing more opportunities for add-ons and various software manipulations. The Microsoft Kinect® is a sensor that allows tracking of 3D objects from the real world. The sensor is described by the Microsoft developers as "… a physical device with depth sensing technology, built-in colour camera, infrared (IR) emitter, and microphone array, [which] can sense the location and movements of people as well as their voices."[12]

Unlike the Nintendo Wii® and PlayStation Move®, Microsoft Kinect® allows operators to interact with virtual reality without a remote controller in their hand. The Microsoft Kinect® sensor is a 24.9 cm x 6.6 cm x 6.7 cm ($\pm$0.3 cm) bar weighing 1.4 kg that is normally located above, or below, the screen.[13] Body tracking on Kinect's latest device senses as many as six complete skeletons with a maximum track of 25 joints per person.[12] With these improved capabilities, positions are more anatomically correct and the range of tracking is broader. Thus, feedback is provided immediately after movement of the user through 3D motion recognition and gesture identification.

Microsoft Kinect® advantages vs. limitations for motion capture

The Microsoft Kinect® has been widely used in motion capture studies. This is, in part, due to the fact that users do not have to wear markers or hold any sensor/controller during the process of motion capture. Bonnechere et al., found that users preferred Kinect® because it was interesting, enjoyable, comfortable, and simply easy to use.[14]

With the numerous benefits of the sensor ability of the Microsoft Kinect® system, Knippenberg et al. researched the motion capture system of the Kinect® in neurological rehabilitation and found that a key advantage of the system was the ability to exercise at home and use it without support of a therapist.[15] As a result user satisfaction with the Kinect® is among the best. Webster et al. found disadvantages of the system such as overexertion and improvement on in-game results/rewards not necessarily correlating with physical functional enhancement.[16] Thus, appropriate training and recurrent follow up observations are needed.

The sensor can be set to either far (default) or near (seated) range mode. Users in a seated mode can be detected up to 2.5 metres away and in far mode, up to 4 metres.[13] This allows the consumer to either stand or sit for tracking therefore allowing the user to be comfortable at all times. With this ability, research and potential projects can be done on those who are ambulatory or immobile. Though, in an evaluation of Kinect's accuracy and reliability, Obdrzalek et al. found that the Microsoft Kinect® skeleton tracking is limited in its use of differentiating other objects from human anatomical structures.[16] For example, a leg of a chair that was in the view of the sensor was mistaken for the user's leg. This is a potential problem when, for example, analysing or evaluating wheelchair bound patients or those using a walking frame.

Webster et al. found that the Kinect® had limitations in capturing fine manoeuvres, as well as limitations in shoulder joint biomechanical accuracy.[17] However, in a study measuring upper extremity movements with the Kinect®, Reither et al. found that the results with the Kinect 2® indicated good reliability as well as further stating that the "…clinical implications of the investigation support the notion that the Kinects could be used in the clinical setting...".[18] The discrepancy in the results may be attributed to when the studies were undertaken. Reither et al.'s paper was published three years after Webster et al., during which the Kinect® system had had significant improvements from the original Kinect® to the Microsoft Kinect 2® released in 2014.[17,18]

Microsoft Kinect®: potential clinical applications requiring motion capture

With the accurate capturing system of the Microsoft Kinect®, one is able to analyse motion with great reliability. One prospective function of Kinect® is the ability to measure range of motion (ROM) movements. This was done by Lee et al. who compared measurements of passive and active shoulder ROM in flexion, abduction, and external rotation made with a goniometer and the Kinect®.[19] They obtained measurements from the Microsoft Kinect® that were in exceptionally close agreement with those taken using a goniometer. Intraclass correlation coefficients (ICCs) for active ROM (aROM) and kinetic ROM (kROM) were the following: flexion, 0.864; abduction, 0.932; external rotation, 0.925. ICCs for passive ROM (pROM) and kROM were the following: flexion, 0.906; abduction, 0.942; external rotation, 0.911. Results led them to suggest that the Kinect® can be used as a suitable alternative in diagnosing adhesive capsulitis of the shoulder (Cohen's kappa values of 0.88, 0.88, and 1.0).[19] This potential of accurate numeric ROM values can lead to many opportunities in the future. For instance, one may include using a step-by-step programme of ROM exercises at home, consequently limiting frequent doctor, physical therapy, and or occupational therapy visits.

The Microsoft Kinect can be used in stroke rehabilitation. Lee (2013) investigated the effects of using the Kinect on muscle tone and strength and activities of daily living (ADLs) of post stroke patients. The experimental group, performed training using video games as well as conventional occupational therapy and the control group trained using only conventional occupational therapy. The Kinect group showed significant improvements in of the shoulder flexor and extensor and elbow flexor and extensor muscle strength, and in the FIM scores for performance of activities of daily living symptoms after the treatment compared to those without the Kinect. Although experimental group was weaker at inception of the study no significant difference was noted between the experimental and control groups. Bao et al. analysed hemiplegic upper limb rehabilitation training for sub-acute stroke patients using Kinect®.[20] They showed improvement and recovery of upper limb motor functioning using the Fugl-Meyer Assessment and Wolf Motor Function Test scores. Functional MRI (fMRI) suggested that Microsoft Kinect® enabled functional neuroplasticity in the brain after stroke.

Assessment of the PlayStation Move®

The PlayStation Move®, one of the later interactive motion controllers, was introduced in 2010 for use with the PlayStation 3® console. With a similar concept to the Microsoft Kinect® and Nintendo Wii® remote, the motions of the player are transmitted through a controller/wand, which is then projected to the console. Though, different to the Nintendo Wii® or Kinect®, the Move® wand is tracked not by a sensor bar but with the PlayStation Eye®, a digital camera device that wirelessly tracks the player's position and movement.[21] The PlayStation Camera® was recently introduced, which is a motion sensor camera similar in structure to the Wii® and Kinect® sensor bar. However, most studies on the PlayStation Move have been done using the PlayStation Eye®.

The primary component of the Move® is within the wand motion controller, which functions similarly to the Nintendo Wii® remote. The controller contains a three-axis accelerometer as well as an angular rate sensor for motion sensing. Location tracking is done through a magnetometer and recognition is through the PlayStation Eye® (or the PlayStation Camera®) and movement of the player is mimicked on-screen in the game.[22]

PlayStation Move® advantages vs. limitations for motion capture

The PlayStation® console has been amongst the best-selling consoles since the launch of the company. It is one of the best-selling systems of all time, and PlayStation® appeared in four out of the seven top spots, with the PlayStation 2® and PlayStation 1® in spot one and two, respectively.[23] The PlayStation 3®, which was the first console to introduce Move® technology, was placed at spot number four on the list, just below the Wii®. Indeed, Simons et al., found the PlayStation® was the most commonly owned video game console among adolescents.[24] Furthermore, the PlayStation 3® with Move® sensors and controllers is $150 USD cheaper than the Xbox One® console with Microsoft Kinect® bundle.[25] Therefore, due to the widely available system of PlayStation®, as well as the lower cost alternative, the PlayStation® optimises the chances for recruiting patients to use this technology in future medical applications.

The vector of force and position of tilt within the wand of Move® are measured by accelerometers, which have been stated as more enhanced in range than the Wii Remote®.[26] Rotation velocity can be detected by the gyroscopes at 2,500 degrees per second, which essentially allows the camera to track and keep up with almost any motion the user performs. However, using data input from a controller and not the entire body, such as with the Microsoft Kinect®, PlayStation Move® cannot acquire well-defined joint motion. Although the PlayStation Move® might detect motions rapidly, it is limited in potential in that regard.

This analysis was tested in a study of 30 normal children comparing the Microsoft Kinect® and PlayStation 3 Move® for potential use in burn rehabilitation by Parry et al.[27] Upper extremity motion use in both the Kinect® and Move® was considered. Subjects' arms were elevated above 120° for longer with the Microsoft Kinect® than the PlayStation Move® ($p<0.05$) and maximum shoulder flexion and abduction, as well as elbow flexion, were significantly greater while playing the Kinect® than the Move® ($p\leq0.01$).[27] Quantifying these data objectively argues that PlayStation Move®, compared to the Microsoft Kinect®, is limited in technology for precise measuring of the upper extremity.

PlayStation Move®: potential clinical applications requiring motion capture

Although not systematically proven to be superior to other systems such as the Microsoft Kinect®, the technology within PlayStation Move® itself, has been noted as the "best position tracking" by Richard Marks, a senior researcher at Sony and inventor of Move®.[26] The most important distinction according to Marks was that Move® could detect movement, at all times, in the Z-plane. This is due to the PlayStation Eye's "detection of the position and relative size of Move's sphere," which works at 60-frames-per-second. Working in the Z-plane, rather than only the X- and Y-plane, it is possible to reach and manipulate the 3D world (for example, picking up and dropping an egg in a game).[26] The availability of this technology exists in the Nintendo Wii® and other systems, though the accuracy in position tracking with Move® was noted as one of the best. Thus, this opens up the door for applying this in prospective scientific endeavours. For instance, it can be assumed that if one mastered the art of manipulating in the 3-dimensional world, one would assume that this training would make operating in the real world that much simpler.

Clinical research with motion capturing devices, especially with at home consoles, is limited, but increasing. More research has been undertaken on enhancing physical activity in adolescents particularly with the PlayStation Move®. This is most likely due to it being the most owned video game console in this age group. Of note, is that the PubMed search in June 2018 using the search string "PlayStation Move" returned only five papers.

Developers and researchers have labelled this enhanced physical activity research with the term "exergaming," thus combining physical exercise with video games. Sween et al. reviewed how "exergaming", using different systems and games, could aid in increasing physical activity.[27] Exergaming increased participants' energy expenditure and increased their physical and mental activity levels. With the amount of movement and distraction that, for example, the Move® provides, "people may be more likely to commit to and maintain an exercise regimen if they are actively engaged in a cognitive activity that they enjoy and that distracts them from the physical activity."[27] While it may seem obvious that exergaming increases physical activity, it is apparent that both mental stamina and persistence are key in applying these to patients in future studies. This component of stamina and persistence aids in helping patients maintain specific programmes that are assigned.

Discussion

The Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® display a wide variety of strengths and weaknesses. Nonetheless, a recurring theme throughout this assessment was that the Nintendo Wii® and the Microsoft Kinect® provided a better platform to conduct clinical research than the PlayStation Move®. This may be due to the overall limited clinical research with the PlayStation Move®. The data on and use of the PlayStation Move® may no longer be relevant due to its partial discontinuation, reduced use and, or limits in technology.

Throughout this process of assessment, a point that should be highlighted was whether the presence or absence of a controller made a difference in the output of the user and overall experience as some potential patients may be unable to hold a controller. This concern stems from the idea that users may desire, especially those patients unable to grasp objects, the absence of a controller in their hands. The Nintendo Wii® and PlayStation Move® both use hand-held controllers for image capturing, but the Microsoft Kinect® does not. Bonnechere et al's. study, the users operated the Kinect® with ease and comfort.[14] This was most likely due to the operator not needing to hold any controllers while operating the console.

Through analysing the corresponding data on all three systems, research published to date fails to provide evidence of superiority of any one system and no study provides an overall comparative review of the three systems. Studies suggest system suitability for research purposes varies significantly, depending on the context of the investigation. Available evidence, suggests that the Microsoft Kinect®, as well as the Nintendo Wii®, are seen as frontrunners in home game consoles for clinical applications. It should be borne in mind that technology is evolving, devices are improving and ongoing research is required.

Juxtaposing the Nintendo Wii® and Microsoft Kinect®

Comparison of the Nintendo Wii® and Microsoft Kinect® is challenging, although the limitations of the Nintendo Wii® make it somewhat simpler to distinguish. For the Wii®, especially through the Wii Fit® programme, the Wii Balance Board® was unique in that it could sense, through pressure sensors and Bluetooth technology, movement patterns and symmetry in balance. It can be used in research, which analyses stability as the core of the project. Current and future projects could help those who are unstable and or immobile. The pressure sensors in the board can be used in other applications such as scooters and possibly balance hover boards to help correct gait and assist in getting patients to walk again. However, the Nintendo Wii® has been proven to be limited in other aspects as far as detection of overall movement of an individual.

In contrast, the Kinect® has been shown to be effective in experimental research due to its sensor ability, compatibility with different software programmes, and overall user satisfaction of the system. The precision of the sensors has improved the reliability of motion research.[13,19] Microsoft Kinect® can be used with different programmes because the Microsoft Kinect® sensor bar is not Microsoft® console specific. This allows developers to use Kinect® with laptop computers.

Future of the Microsoft Kinect®: iPi Soft

The overall interactive and hands-free movement of Kinect®, as well as possible manipulations with a wide range of programmes and add-ons, expands the clinical potential of Microsoft Kinect®. The device allows accurate detection of a user's motions without a hand-held controller. This permits a broad spectrum of future projects. For example, the Kinect® could be useful for follow-ups as well as home based exercises prescribed by physicians or other healthcare providers. Thus, in exercise prescriptions and follow up appointments (e.g. for any type of joint injury), a patient would be able to accurately do different range of motion exercises at home. These data could be sent to providers and analysed without requiring the patient visiting a provider's office.

This highlights another important aspect of telemedicine, the ability to send information on specific ranges of joint motion, as well as exercise set-up. This can be viewed by providers either synchronously or asynchronously. Duruturk et al. analysed the effects of a telemedicine intervention on exercise capacity in patients with type II diabetes mellitus in which callisthenic exercises, done at home, were supervised by physiotherapists using videoconferencing.[29] The intervention was successful even though it lacked the ability to detect precise exercise movements of the patients. For routine rehabilitation simply looking at the exercise done a screen may be enough for the therapist. However, accurate data may be needed when the therapist would like to monitor progress by measuring exact movement or position of a joint in an exercise plan. iPi Soft and Microsoft Kinect® can accurately capture these data.

iPi Soft motion capture software uses 3-dimensional depth sensors to record human joints, with centimetre-level accuracy.[30] The software also allows the generation of 3-dimensional animations with the input data from a sensor (such as the Kinect®). In one application using iPi Soft, Colombo et al. set up a virtual 3-dimensional model of a prosthetic leg using a patient's anthropometric measures.[31] This allowed the researchers to design and convey performance of the prosthesis while providing a method for designers to correctly take measurements for future applications.

Telehealth Policy Initiatives and Standards

While it is evident that this technology can be beneficial, telehealth and telemedicine policy initiatives and standards for service need to be addressed. For example, in North America, the American Academy of Family Physicians (AAFP) agrees that telehealth and telemedicine are "appropriate and efficient means of improving health, when conducted within the context of appropriate standards of care."[32] The AAFP also states that the service of telehealth and telemedicine should not be led by subjective policies, but by appropriate and adequate aid to the patient. As far as licensure goes, the AAFP suggests simplified licensure processes and procedures to be able to deliver healthcare from different areas (whether nationally and or internationally). The AAFP encourages states to have a licensure framework "where patients with an established relationship, who are travelling, should be allowed to be treated by their primary care physician, so long as the physician is licensed in the state in which the patient receives their usual care."[32]

Dinesen, et al. identified current outdated lack of telehealth and telemedicine policy issues that need attention, such as the issue of licensing and jurisdictional matters.[33] In an attempt to solve these complications, they suggested generating uniformity between existing modes of healthcare and forms of telehealth, defining telehealth care appropriately to limit confusion, emphasise its usefulness, and creating more opportunities for telehealth and telemedicine. Thus, with this astute agenda, a set of policy rules could become the standard for current and future telehealth and telemedicine applications.

In an attempt to expand telemedicine in the United States, the Interstate Medical Licensure Compact Commission now allows physicians to practice telemedicine across state lines. As of 2017, eighteen states have passed legislation to implement the Interstate Medical Licensure Compact. This legislature allows physicians to attain a license to practice medicine in any participating Compact state via an application process.[34] Transitioning to a global scale, health care systems differ from country to country. Whether at a local level or internationally, the area of telehealth policy and standards is extensive and complex. With technology continuing to advance, accommodating telehealth universally, licensing organizations will need to continue to create policy that adapts to the ever-changing field of telehealth and telemedicine.

Conclusion

Telemedicine is the future of health care delivery globally. This assessment of the Nintendo Wii®, Microsoft Kinect®, and PlayStation Move® found the Microsoft Kinect® to be the most all-around clinically applicable home console system for motion capture for telemedicine. With its wide range of measuring, simulating, and diagnosing capabilities, many clinical experiments could be performed using this equipment. This new approach, through motion capture, transforms not only the way healthcare is delivered, but also the way medicine is viewed as a whole. Through appropriate application of such technology, care could be provided to those patients who have difficulty walking, along with other disabilities, thereby increasing the efficiency of patient care. In an age where technology is present in most aspects of humanity, telemedicine with motion capture applications should be leveraged by healthcare providers to maximise its potential.

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