IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

VIRTUAL REALITY IN HEALTHCARE: AN OVERVIEW

M. Pratibha*[1] , Varshini G[1] , Dikshita Madkatte[2], V. Sireesha[3]

1*- Department of Pharm D, CMR College of Pharmacy, Kandlakoya, Hyderabad, India.

1- Department of Pharm D, CMR College of Pharmacy, Kandlakoya, Hyderabad, India.

2- Department of Biomedical Engineering, Anhalt University of Applied Sciences, Saxony-Anhalt, Germany.

3- Associate Professor, CMR College of Pharmacy, Kandlakoya, Hyderabad, India.

ABSTRACT:

Virtual reality is simulated environment which is created with the help of software tools. It immerses the user in this artificially created environment and makes him feel the reality. The user interacts in this environment using special hardware tools such as VR headsets, gloves for haptic feedbacks and display screen for visualizing. Other output devices used are mouse, chaser, speakers and so on. The scope of this technology has expanded in various domains. It is an emerging technology which can lead to more advanced and automated performance of various tasks. One of the major applications is in medical field. This technology finds its application in diagnosis of disease, training medical professionals academically and practically, aiding doctors while performing surgeries and therapy. These potential applications are studied and described briefly. Also, this technology can be used for marketing medical devices, disease awareness and patient education. Additionally, future prospects of this booming technology are studied.

KEY WORDS: Virtual reality, Simulated Environment, headsets, Diagnosis, Medical training.

INTRODUCTION:

Virtual Reality has begun its enthralling takeover of healthcare, much to the delight of both patients and healthcare professionals [1]. Virtual reality (VR) refers to a technology that allows a user to utilise a VR headset to replicate a situation or experience of interest within an interactive but computer-generated environment. The simulation is immersive, thus special 3-D goggles with a screen or gloves that provide sensory feedback may be required to assist the user learn from their experiences in this virtual world [2]. In fact, this technique entails the use of a computer to simulate the peripheral environment as well as communication via a receiver[3].

The field of medical virtual reality holds a lot of promise. It has sparked the imaginations of not only science fiction readers, but also clinical researchers and medical professionals. Despite the fact that the field is still in its infancy, there are more and more compelling examples of virtual reality improving the lives of patients and clinicians [4]. Virtual reality includes output devices (vision, hearing, tactile, and power transmitter), input devices (mouse, chaser, gloves, and so on), a graphical production system for the virtual environment, and information software[5].

Virtual reality is employed in a range of applications in healthcare. Medical education, including for doctors in training and students, patient treatment, medical marketing, and educating people about a disease, medical condition, or process are all examples of these [6].

1) MEDICAL TRAINING:

Despite advances in the instruments and techniques used in medicine, medical education has remained substantially unaltered for hundreds of years [7].

The use of Virtual Reality (VR)-based visualisation and training environments in anatomy teaching transforms the learning experience from memorising structures without a true understanding of the 3-Dimensional (3D) relationships to a process that involves a thorough understanding of the structure based on visualisation rather than memorising, making the learning process more efficient, enjoyable, and time consuming [8].

This setup allows students and trainees to learn in a virtual world by using their motor skills and hand movement to accomplish a set of activities. This type of training environment can also be used as a supplement to traditional teaching material such as books and videos, which do not give an immersive learning experience [9].

Rather of studying as an apprentice, medical simulation enables the acquisition of clinical skills through purposeful practise. Simulation tools can be used instead of real patients. Without concern of injuring the patient, a trainee can make mistakes and learn from them [10].

2) PATIENT TREATMENT:

Although virtual reality is still a relatively young and understudied technology, there has been noticeable progress in its research. This tendency could lead to more individualised and personalised therapies and diagnostics.[11]

Virtual reality is majorly used for diagnosis and detection of neurological disorders. Also, for appropriate motor solutions in rehabilitation therapy. Following are few domains described regarding the treatment deploying virtual reality:

PATIENT EDUCATION:[12]

Virtual Reality's capacity to observe the inside of the human body is beneficial not just to doctors, but also to patients. Patients can virtually step inside a patient-specific 360° VR reconstruction of their anatomy and pathology to be guided through their surgical plan. As a result, patients have a better grasp of their treatment and, as a result, are more satisfied.

ROBOTIC SURGERY:[12]

Robotic surgery is a relatively new concept in which a human surgeon controls a robotic instrument, such as a robotic arm, to perform surgery. As a result, there are fewer risks of complications during surgery and the procedure is completed faster. The robotic equipment is precise, resulting in smaller incisions, less blood loss, and a quicker recovery time.

MENTAL HEALTH AND PSYCHOLOGICAL THERAPY:[12]

VR's one-of-a-kind ability to build a world that can be utilised to generate sophisticated simulations of circumstances in which psychological problems arise. A therapist is no longer required to accompany a client on a trip to a crowded shopping mall or up a tall structure. At the stroke of a mouse, situations that are impractical or impossible to duplicate — such as flying or the terrible incidents that might lead to PTSD — can be conjured up. In-person coaching, which has been shown to be useful for a variety of diseases, can now be offered in the consulting room, with simulations rated in complexity and repeated as needed.

Virtual reality has also been used to prevent memory loss, assist autistic youngsters in the classroom, and collect data for dementia research.

PAIN MANAGEMENT AND PHYSICAL THERAPY:

Pain is a perception that is linked to attention, mood, and emotions. It assists patient’s modify their attitude to be less focused on pain and worry by using virtual reality. Virtual reality for pain management is one of the most well-studied and widely used applications of the technology. For decades, doctors have understood that this technology "distraction therapy" is an useful technique for treating pain and pain anxiety. Adults might also benefit from virtual reality for pain management. When

VR is used with medication, it can help persons with burn injuries feel less discomfort during wound care.

According to new research by Spiegel, virtual reality can help people with a variety of medical issues, including cancer, orthopaedic problems, and stomach pain.[13]

Virtual reality for physical therapy has also been demonstrated to reduce recovery time. Allowing patients to complete their daily activities in a virtual setting makes the task more enjoyable, keeps them focused, and keeps their spirits up during what may be a long rehabilitation time.[14]

REHABITILATION AND THERAPY:[15]

VR is also assisting individuals with balance and mobility issues as a result of a stroke or brain injury. Patients who have survived a stroke or traumatic brain injury must act quickly. The sooner a person begins rehabilitation, the more likely they are to restore lost functions. Such patients might quickly identify novel ways to lift their arms or move their fingers with the help of virtual reality. Patients become more resilient and positive as a result of this experience, and their once-traumatized neural systems can heal faster than expected.

DIAGNOSIS:[16]

Clinicians have diagnostic and intervention alternatives that are not available using traditional approaches because they can measure and record all behavioural reactions generated by the establishment of dynamic, interactive, and stimulating settings. Diagnostic imaging technology is significantly ahead of other medical disciplines in terms of development. The use of radiological cross-sections to create a simulated three-dimensional reconstruction of organs has become a significant diagnostic tool, giving clinicians a more lifelike perspective of the patient's anatomy. With the addition of sophisticated visualisation software to the existing technology basis, high-resolution data production and collecting are made possible, resulting in a value by decreasing human time and expense while boosting therapeutic efficacy. CT, MRI, x-ray imaging NM, ultrasound, and computed radiography are some of the imaging modalities that represent computer-aided uses of VR in radiology. Autopsy, gross and microscopic examination, and digital pathology are all possible with VR simulation. Remote supervision and annotation, 3D picture viewing and editing, and tele-pathology in a mixed-reality environment are all unique uses.

3) MEDICAL MARKETING:[17]

Marketing was the most common early application of virtual reality across all industries, and it remains a very potent and effective marketing tool. We recently designed a virtual reality experience for Bayer (which we sadly can't discuss) to promote a new product, while GlaxoSmithKline included VR into the core of its "The Migraine Experience" campaign. Migraine sufferers choose their migraine symptoms and then passed the VR headgear to their non-migraine-suffering partner to experience a migraine for

themselves, but without the discomfort. The headset simulated some of the symptoms of a migraine, such as blind spots, auras, light sensitivity, a pounding headache, and confusion. On the campaign, GSK collaborated with migraine experts as well as virtual reality (VR) experts. GSK has created an app version of the experience that anyone may download at home and try out on their smartphone.

4)DISEASE AWARENESS:

AbbVie, a pharmaceutical research and development business, designed an experience to improve awareness among healthcare professionals about Parkinson's disease sufferers' daily struggles. People could put on a headset and see first-hand how a Parkinson's sufferer navigates a virtual supermarket, confronting unpleasant times while coming into contact with other people, at a pharmaceutical industry trade show.[17]

Virtual Reality (VR) can also aid battle the pandemic by providing audio-visual-based virtual communication. VR technology creates a platform for doctors to interact with infected **COVID-19** patients without needing to see them face to face.[18]

FUTURE PROSPECTS OF VR:

Many of the above-mentioned applications are still in their infancy. In the coming years, virtual reality (VR) will be increasingly employed to increase the accuracy and effectiveness of current operations, as well as to expand the capacities of humans, both as caregivers and as patients. Simply said, the potential for virtual reality in healthcare is enormous, limited only by the inventiveness and brilliance of those who develop and utilise the technology.[19]

Virtual reality applications in healthcare will become more common in the future. Any challenging procedure can be performed precisely and safely by doctors and surgeons. To arrange a successful surgery, the surgical team can see the soft and hard tissue inside the patient's body. It will develop into complex devices and a potent tool for high-quality visualisation. Knowledge, skill, habits, and other needed disciplines can all be improved by working in the medical field. This technology will be used to optimise the design of buildings, industries, and hospitals. In the next years, it will grow more intelligent, allowing all medical processes to be brought into the digital realm. Virtual reality has intriguing techniques for saving and improving the patient's life. It immediately corrects any deficiencies in the surgeon's ability. This immersive technology can be used for teaching in the operating room at any time and in any location. With the use of this technology, one may quickly monitor the disease's correct and incorrect situation. It instructs doctors and nurses about the biological mechanisms of the human body. In a virtual environment, this technology provides realistic and accurate simulations.[20]

CONCLUSION:

The utility of virtual reality, as a complementary method, performs an important position in enhancing the performance of different scientific businesses. Considering that laparoscopic surgical operation is one of the most crucial surgical strategies that is taught the use of virtual truth, man or women and trendy elements affecting its genuine implementation have to be diagnosed. With recognize to the outcomes of the prevailing take a look at, it's far recommended that digital reality ought to be utilized in training such competencies as laparoscopic surgical treatment, training of orthopedic residents, Gynecology citizens,ultrasound, nursing approach and paramedical interventions. Similarly, it appears essential to do studies to determine the effectiveness and usability of the approach and satisfaction of the traineers and patients.

ABBREVATIONS:

VR- Virtual reality, CT- Computerized tomography, MRI- Magnetic resonance imaging, GSK- GlaxoSmithKline, PTSD- Post traumatic stress disorder.

ACKOWLEDGEMENT:

We are thankful to the management of CMR College of Pharmacy for providing and access to online resources for the literature survey to complete this review successfully. We also thank our guide Dr. V. Sireesha for her constant support.

CONFLICT OF INTEREST:

The author declares that there is no conflict of interests.

REFERENCES:

1. Mesko DB, 5 Ways Medical Virtual Reality is Already Changing, The Medical Futurist. https://medicalfuturist.com/5-ways-medical-vr-is-changing-healthcare/

2. Dr. Thomas L, MD Applications of Virtual Reality In Medicine. https://www.news-medical.net/health/Applications-of-Virtual-Reality-in-Medicine.aspx

3. Samadbeik M, Yaaghobi D,etal. The Applications of Virtual Reality Technology in Medical Groups Teaching, Journal of Advanced Medicine Education Profession. 2018 Jul; 6(3): 123–129. PMID:30013996.

4. Dr.Mesko B, 5 Ways Medical Virtual Reality is Already Changing, The Medical Futurist. https://medicalfuturist.com/5-ways-medical-vr-is-changing-healthcare/
5. Batani P, Abhari S, etal. The Applications of Virtual Reality Technology in Medical Groups Teaching, J Adv Med Educ Prof. 2018 Jul; 6(3): 123–129. PMCID:PMC6039818.
6. Dr. Thomas L, Applications of Virtual Reality In Medicine. https://www.news-medical.net/health/Applications-of-Virtual-Reality-in-Medicine.aspx
7. Ruthenbeck, GS, Reynolds KJ (2015). *Virtual reality for medical training: the state-of-the-art. Journal of Simulation, 9(1), 16–26.* doi:10.1057/jos.2014.14
8. *J. Falah, Harrison DK, etal. Virtual reality medical training system for anatomy education, 2014 science and information conference, 2014, 752–758.* doi:10.1109/sai.2014.6918271.
9. Mathur AS, Low cost virtual reality for medical training, IEEE virtual reality (VR),2015, *345–346.* doi:10.1109/VR.2015.7223437.
10. Ruthenbeck GS, Reynolds KJ. *Virtual reality for medical training: the state-of-the-art. Journal of Simulation, 9(1), 16–26.* doi:10.1057/jos.2014.14
11. Palomer X, How Can Virtual Reality Help Diagnose Mental Disorders https://psious.com/how-can-virtual-reality-help-diagnose-mental-disorders/
12. Engels H, Virtual Reality In Healthcare, Visualise Creative Limited (VLC) Co Regd No.05813232, September 22, 2017.
13. Delzell E, Virtual Reality In Medicine, WebMD Corporation. https://www.webmd.com/a-to-z-guides/features/virtual-reality-medicine
14. Engels H, Virtual Reality In Healthcare, Visualise Creative Limited (VLC) Co Regd No.05813232, September 22, 2017.
15. VR In Medical Field, Elara Systems. https://elarasystems.com/vr-medical-field/
16. Aziz, Hassan. (2018). Virtual Reality Programs Applications in Healthcare. Journal of Health & Medical Informatics. 9. 305. 10.4172/2157-7420.1000305.
17. Engels H, Virtual Reality In Healthcare, Visualise Creative Limited (VLC) Co Regd No.05813232, September 22, 2017.
18. Singh RP, Javaid M, Significant applications of virtual reality for COVID-19 pandemic, Diabetes Metab Syndr. 2020 July-August; 14(4): 661–664.
19. Engels H, Virtual Reality In Healthcare, Visualise Creative Limited (VLC) Co Regd No.05813232, September 22, 2017.
20. Javaid M, Haleem A, Virtual reality applications toward medical field,Clinical Epidemiology And Global Health, 8(2); 600-605, doi:https://doi.org/10.1016.