12-2022

The use of virtual reality as a standard of care in verified burn centers

Emily Werner
St. John Fisher University, ewerner@sjfc.edu

The use of virtual reality as a standard of care in verified burn centers

Abstract

This study explored whether the use of virtual reality (VR) was a standard of care during burn care at burn verified facilities in the United States. Surveys were sent to American Burn Association verified burn centers to investigate if VR was being used as a standard of care, if protocols for using VR are in place and how they were developed, and what barriers these facilities are facing and several other topics investigated. Out of the 64 facilities surveyed, 21 responses were collected. Burn facilities reported 63.2% do not use and 36.8% do use VR while performing burn dressing changes and debridement. Only one out of seven respondents who reported they use VR considered it a standard of practice at their facility. Out of the seven hospitals currently using VR, two reported a decrease in opioid use with burn care with the use of VR. Although the current results indicate that VR is not frequently used clinically during burn care at most burn centers, 83.3% of burn centers reported they see themselves using VR in the future. As VR becomes more widely disseminated, future research should be conducted to continue to see if VR is becoming a standard of care and whether VR is making clinical impacts on pain, opioid use, and level of anxiety among burn patients.

Document Type

Article

Degree Name

M.S. in Advanced Practice Nursing

First Supervisor

Tara L. Sacco PhD

Subject Categories

Nursing

Comments

Published in BURNS, Volume 50, Issue 4 (May 2024), pages 808-812

DOI: https://doi-org.pluma.sjfc.edu/10.1016/j.burns.2024.01.010

Is the use of Virtual Reality a standard of care in verified burn centers?

By

Emily Werner, RN, MSN

All correspondence can be sent to:

emily_werner@urmc.rochester.edu

or

Emily Werner

601 Elmwood Ave.

Rochester, NY 14642

Abstract

This study explored whether the use of virtual reality (VR) was a standard of care during burn care at burn verified facilities in the United States. Surveys were sent to American Burn Association verified burn centers to investigate if VR was being used as a standard of care, if protocols for using VR are in place and how they were developed, and what barriers these facilities are facing and several other topics investigated. Out of the 64 facilities surveyed, 21 responses were collected. Burn facilities reported 63.2% do not use and 36.8% do use VR while performing burn dressing changes and debridement. Only one out of seven respondents who reported they use VR considered it a standard of practice at their facility. Out of the seven hospitals currently using VR, two reported a decrease in opioid use with burn care with the use of VR. Although the current results indicate that VR is not frequently used clinically during burn care at most burn centers, 83.3% of burn centers reported they see themselves using VR in the future. As VR becomes more widely disseminated, future research should be conducted to continue to see if VR is becoming a standard of care and whether VR is making clinical impacts on pain, opioid use, and level of anxiety among burn patients.

Key Words: Burn Care and Virtual Reality

Introduction

According to the American Burn Association (ABA), in 2016, 486,000 burn injuries were reported in the United States requiring medical treatment (U.S.) (ABA, 2016). From those patients, 40,000 were hospitalized due to their burn injuries. When a patient experiences a burn injury, they are encouraged to visit a provider at a verified burn center if possible. Tissue damage from a burn injury can be one of the most traumatic injuries one can experience (Ghezelijeh et al., 2017), in part because of the intense and frequent wound cleaning and physical therapy. Healthcare providers treat these injuries by performing daily dressing changes, wound debridement, and surgery when indicated. Pain and discomfort from burn injuries is challenging to control amongst this patient population and is part of the recovery process. Treating a burn patients' pain often requires a multimodal approach including opioid and non-opioid analgesics and complementary therapies. Integration of knowledge from physical therapy (PT) and occupational therapy (OT) is also needed to treat and care for burn patients (Garrido-Ardila et al., 2022). In order for the burn patient to achieve a positive result, this multidisciplinary approach to care is needed.

Pain management for a burn patient is complex and differs based on the different phases of care (Romanowski et al., 2020). Anxiety is also a common human response a burn patient may experience while hospitalized with a burn injury (Ajoudani, Rezaei, & Maslakpak, 2020). The use of opioids, non-opioid analgesics, and anti-anxiety medications are the most common methods used to control burn pain (Ghezelijeh et al., 2017). Physiology, pharmacology, and the physicians experience should all be considered when prescribing opioids (Romanowski et al., 2020). The therapy should be individualized, continuously adjusted, and used in conjunction with non-opioid and non-pharmacologic measures. Nonpharmacologic pain control techniques

should also be offered as an adjunctive measure and when available, cognitive-behavioral therapy, hypnosis, and virtual reality have the strongest evidence (Romanowski et al, 2020). Commonly used anti-anxiety medications for burn dressing changes include benzodiazepines like Lorazepam (Ativan), Midazolam (Versed), and Diazepam (Valium) (Robert et al., 2000).

The use of virtual reality (VR) could provide a positive influence on the burn patients' physical and cognitive aspects of pain and anxiety by providing a distraction from burn dressing changes and debridement (Hsu et al., 2016, Kaya et al., 2023). Virtual reality is just one complementary therapy for nurses and clinicians to take into consideration when treating burn pain. It is believed VR can shift the attention away from painful stimuli and into the generated computer world (Hoffman et al., 2008). The VR programs are interactive, thus distracting the patient while procedures like burn dressing changes and debridement are being performed. There are various ways VR can be delivered to the patient. The most common method is when VR programs are projected onto either a computer or iPad screen and a set of headphones are provided to the patient to hear the audio playing (Ford et al., 2018).

In McSherry et al. (2018), researchers examined the effects of immersive VR and the amount of opioid medications used during burn care. Fifty-seven percent of participants stated they felt VR decreased the amount of pain experienced and 50% reported a decrease in their anxiety when it came time for burn care while using VR. One study investigating hypnosis through immersive VR, participants showed a 29% decrease in the amount of time spent thinking about pain during burn care and a 25% decrease in amount of anxiety experienced during dressing changes when VR was utilized (Patterson et al., 2006). The amount of anxiety is often also decreased when VR is utilized (Kaya et al., 2023).

With the use of VR, nurses can remove more dead tissue while performing burn dressing changes and debridement with the positive impact of quicker healing and decreasing infection (Furness et al., 2019). To assure best-practice, it is important for nurses and providers to take into consideration the potential to improve overall nursing care and patient outcomes. It is unknown what the role of VR is in burn centers. The aim of this study was to identify if VR is a standard of care while performing burn dressing changes and wound debridement. The impact of VR on opioid use, anxiety levels, and length of stay were analyzed among the facilities which are currently utilizing VR.

Methods

A survey study was conducted to collect data pertaining to the current use of VR amongst ABA verified burn centers. These facilities were selected using the ABA website which differentiates verified burn centers throughout the U.S. from non-verified burn centers. Burn centers which were not verified by the ABA were excluded from the study. Contact information pertaining to who manages the burn program at each facility was collected and organized in an Excel spread sheet according to each burn center's website. Once the contact information was collected, a survey was created and distributed to the 64 ABA verified facilities programs to investigate if the implementation of VR is part of their standard of care with burn patients or if this intervention is not (Appendix). The survey was reviewed by the St. John Fisher College Institutional Review Board (IRB) before distribution.

The survey was developed by incorporating multiple choice, open-ended, and fill-in-the-blank questions. Consent for participating was included as the first question on the survey. Additional questions on the survey included number of burn beds at each facility, role in the burn program, type of patient population pertaining to age, if VR is used in their facility, and if there

was a protocol in place for VR. Surveys were distributed via email to all the ABA certified burn center program directors or coordinators using Qualtrics. The facilities had two months from the distribution date to review and complete the survey. Reminder emails were sent out through Qualtrics to non-respondents after the first 30 days. At the completion of the 60 days of distribution, data was analyzed using SPSS 28 and excel. Frequencies and proportions were calculated for all categorical and numeric responses. Additionally, open-ended responses are presented in themes.

Results

Out of the 64 surveys sent out, 21 were received which resulted in a 33.3% response rate. Of the 21 responses, 19 were fully completed, therefore, the results of the survey are from 19 ABA verified burn centers. The number of beds in each burn unit ranged from 10 to 50, with one participant not providing a response. Only 33.3% of the respondents reported caring for only adult burn patients, with the remaining 66.7% of respondents providing care to both pediatric and adult burn patients. Respondents to the study held many different roles in the program with 8.3% chiefs, 58.3% directors of a burn program, and 33.3% burn program managers.

Results showed 36.8% of respondents utilized VR while performing burn care dressing changes and wound debridement. Of the seven respondents who reported using VR at their burn center, only one considered VR as a standard of care. Fifty percent reported cost or lack of funding has prevented them from implementing VR at their facility. Other common themes of why VR is not being used included limited success with early trials of VR, infectious disease not signing off on multi-use equipment, issues with training staff on how to use the equipment, and lack of resources within their facility. Although respondents who do not use VR reported cost as a factor for not utilizing this type of therapy, 75% have considered using VR in the past and

83.3% reported they can see their facility utilizing VR in the future for burn dressing changes and debridement.

Of those 36.8% of facilities utilizing VR, their programs were commonly funded by a foundation or capital funds from their hospital. The use and development of a VR protocol was also investigated with four reporting they have a protocol in place about the use of VR during burn dressing changes and debridement. Each facility reported on how they developed their protocol. Common themes from those who were involved in developing the protocol included child life, clinical nurse specialists, nursing, and different types of therapy. Two out of the seven respondents reported they only use VR for research purposes, two who do not use VR for just research, and three who did not answer.

Specific questions were asked pertaining to if the use of VR was used across different units (e.g. ICU and floor) and what type of patient population was receiving VR as a form of treatment. Four respondents reported they do not use VR across different hospital units, two respondents did, and one did not respond to the question. One respondent stated they only use VR on adults, one stating VR is only used on pediatric patients, four who use VR on both adults and pediatric patients, and one respondent who left the question unanswered. Six out of the seven respondents reported their patients do not need a specific total body surface area (TBSA) to receive VR treatment during their dressing changes or wound debridement.

The impact of VR on the use of opioids and anxiety medications was also examined. Two out of the seven respondents reported they have seen a decrease in the amounts of opioids used while performing burn dressing changes, two reported no change, and three did not answer. Three of the respondents reported VR decreased the amount of anxiety patients had when it came to performing burn care. One respondent reported no change in patient anxiety levels while using

VR and three did not answer the question. One respondent reported they have experienced a decrease in the length of stay for their patients when VR was used, three who have not seen an impact, and three who did not answer the question.

Discussion

The aim of this study was to discover if VR is currently a standard of care at ABA verified burn centers while performing burn dressing changes and wound debridement. The study showed seven participants use VR for burn dressing changes and one considers VR a standard of care within their facility. Distraction and VR have shown positive effects on burn patient outcomes, however, being able to identify whether VR is cost effective, and a feasible intervention is important. Many VR devices can cost as low as $20; however, some systems can cost up to $200 or more (Ford et al., 2018). Data collected from this current study has shown the majority of those who do not use virtual reality is due to its cost. Of the few facilities that reported they do use VR, they paid for their VR program through mostly private funding.

Furness et al. (2019) reported although patients and staff can seem reluctant to use VR as a form of therapy for pain and anxiety management, once educated on its positive impact and easy use, they are more inclined to use it. Many patients from their study (Furness et al., 2019) stated initial anxiety disappeared after receiving a brief educational session and they were "excited to try it" with future dressing changes. Nurses also stated they were impressed with how well VR worked while performing dressing changes (Furness et al., 2019). Patients can experience a good level of distraction while experiencing little to no side effects, such as nausea, while using active VR. Many can still experience some pain; however, they are not concentrating directly on their pain, but more focused on participating in the VR experience (Furness et al., 2019).

According to Hoffman et al. (2008), appropriately dosed pharmacologic analgesics help reduce pain either at rest or when not undergoing a procedure. However, during daily wound care procedures such as bandage removal and debridement, opioid analgesics alone fail to adequately control pain (Hoffman et al., 2008). Opioid use and anxiety levels were analyzed with the data providing mixed results due to missing data. Out of the seven hospitals that currently use VR, two reported they have seen a decrease in opioid use during burn care which is consistent with prior research (Ghezelijeh et al., 2017; Hoffman et al., 2008; McSherry et al., 2018). Although data from the current study indicates there has been a decrease in number of opioids used during burn care and debridement, it is not possible to conclude with complete confidence that VR in practice at verified burn centers is directly associated with a decrease in opioid use among burn patients.

Virtual reality has shown to not only have a positive impact on improving pain, but also improving joint range of motion to the affected burned joint (Garrido-Ardila et al., 2022). Garrido-Ardila et al. (2022), found in a systematic review the use of VR decreased medication intake directly used for pain during physical rehabilitation range of motion exercises. The use of VR also allowed for a greater variety of therapeutic techniques to be used by physical and occupational therapists allowing them to achieve maximum range of motion in the effected burned joint. With the contribution of VR as a form of pain management, there can be a decrease in the negative consequences on the burn patient from their injury (Garrido-Ardila et al., 2022).

Virtual reality has also had an impact on anxiety levels experienced by burn patients. According to prior research (Robert et al., 2000), anxiety has been seen as a common response from a burn patient who has experienced emotional and physical trauma from their burn injury. In this current survey, three of the respondent’s reported that the use of VR had decreased

anxiety levels during burn dressing changes and debridement. Data from the current survey is consistent with prior research (Robert et al., 2000 & Ghezelijeh et al., 2017) which supports VR and the decrease in anxiety levels in burn patients while burn dressing changes and debridement is being performed. Although this current study supports the notion that VR can decrease amounts of opioids used and anxiety levels, there needs to be caution with overreaching conclusions due to the small sample size of our survey.

The current study is the first to assess how many burn units in the United States are using VR analgesia, and how many have VR included in their standard of care. The survey study design increases generalizability and the sample was representative of the study population. The design of the study also allowed respondents to provide more detailed information regarding to how they paid for VR, why they did or did not use VR, who helped them develop their VR protocol, and who ran the VR program. This data collected was valuable in revealing detailed insights into what is preventing more burn centers from utilizing this newer pain management technology amongst burn patients and how their policies and procedures revolving around the use of VR were created and implemented.

Limitations and gaps to this study included both the response rate and number of incomplete surveys. The low response rate reduces the power of the study which can lead to a higher variability making it difficult to determine if the findings are true. However, the response number is similar to other studies done regarding VR and burn patients (McSherry et al., 2018, Patterson et al., 2006). The incomplete surveys were excluded from this study to not skew any data. The use of open-ended questions to collect data could have also caused survey fatigue.

Although many respondents did not consider VR as a standard of care, according to the current survey, VR does show to decrease the amount of pain and anxiety experienced during

burn dressing changes and debridement and is a standard of care in at least one ABA burn center. Several respondents indicated VR should be implemented at the bedside as a form of pain and anxiety management for burn patients. Furthermore, 83.3% reported they can see their facility utilizing VR in the future for burn dressing changes and debridement. Nursing should be at the forefront of this intervention since they should not only implement this as an evidence-based initiative, they should lead future research in this area.

Declaration of Interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. There was no funding provided to the author for completion of this study.

References

Ajoudani, F., Rezaei, S., & Maslakpak, M. (2020). Non-pharmacological interventions for anxiety in burn patients: A systematic review and meta-analysis of randomized controlled trials. *Complementary Therapies in Medicine, 49.*

American Burn Association. (2016). Burn Incidence Fact Sheet. https://ameriburn.org/who-we are/media/burn-incidence-fact-sheet/.

Ford, C., Manegold, E., Randall, C., Aballay, A., & Duncan, C. (2018). Assessing the feasibility of implementing low-cost virtual reality therapy during routine burn care. *Burns, 44*, 886-895.

Furness, P., Phelan, I., Babiker, N., Fehily, O., Lindley, S., & Thompson, A. (2019). Reducing pain during wound dressings in burn care using virtual reality: a study of perceived impact and usability with patients and nurses. *Journal of Burn Care & Research, 35*, 491-499

Garrido-Ardila, E.M., et al. (2022). A Systematic Review of the Effectiveness of Virtual Reality-Based Interventions on Pain and Range of Joint Movement Associated with Burn Injuries. *Journal of Personalized Medicine*, *12*(8).

Ghezelijeh, N., Ardebili, M., & Rafii, F. (2017). The effects of massage and music on pain, anxiety and relaxation in burn patients: Randomized controlled clinical trial. *Burns, 43*(5), 1034-1043.

Hoffman, H., Patterson, D., Seibel, E., Soltani, M., Jewett-Lehay, L, & Sharar, S. (2008). Virtual reality pain control during burn wound debridement in the hydrotank. *The journal of clinical pain, 24*(4), 299-304.

Hsu KC., Chen LF., & Hsiep, PH. (2016). Effect of music intervention on burn patients' pain and anxiety during dressing changes. *Burns, 42*(8), 1789-1796.

Kaya M, Karaman Özlü Z. The effect of virtual reality on pain, anxiety, and fear during burn dressing in children: A randomized controlled study. Burns. 2023 Jun;49(4):788-796.

McSherry, T., Atterbury, M., Gartner, S., Helmold, E., Serles, D., & Schulman, C. (2018). Randomized, crossover study of immersive virtual reality to decrease opioid use during painful would care procedures in adults. *Journal of Burn Care & Research, 39*(2), 278 285.

Patterson D., Wiechman, S., Jensen, M., & Sharar, S. (2006). Hypnosis Delivered Through Immersive Virtual Reality For Burn Pain: A Clinical Case Series. *International Journal of Clinical and Experimental Hypnosis 54*(2), 130-142.

Robert, R., Blakeney, P., Villarreal, C., & Meyer III, W. (2000). Anxiety: current practices in assessment and treatment of anxiety of burn patients. *Burns, 26*, 549-552.

Romanowski, K., et al. (2020). American Burn Association Guidelines on the Management of Acute Pain in the Adult Burn Patient: A Review of the Literature, a Compilation of Expert Opinion, and Next Steps. *Journal of Burn Care and Research, 41*(6), 1129-1151.