The Use of Virtual Reality as a Nursing Intervention for Anxiety in Patients with Cancer

Submitted by

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Abstract

Distractions help to decrease anxiety, and virtual reality is a new form of distraction with the potential to relieve anxiety (Glennon et al., 2018). The use of virtual reality as a nursing intervention is a potentially effective way of decreasing anxiety in patients with cancer. However, there is currently insufficient empirical evidence regarding whether this nursing intervention is correlated with decreased anxiety in patients, which constitutes a gap in the current knowledge. This thesis aims to answer what factors need to be evaluated in order to fill the knowledge gap and determine if a correlation exists between the use of virtual reality as a nursing intervention and decreased anxiety in cancer patients. Nursing articles about the intervention of virtual reality for anxiety relief were found through the Cumulative Index to Nursing and Allied Health Literature (CINAHL) along with set search terms and filters for relevancy.

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Lastly, I would like to thank my mother, Joy Espedido, for being my inspiration for this thesis. Her hard work and strength throughout her cancer treatment show resilience and reason to continue research in patients with cancer.

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Current Research

Anxiety is an uneasy feeling of discomfort or dread (Ackley et al., 2017). Psychologically, anxiety can heighten the perception of pain and can become maladaptive if left unresolved (Holman et al., 2019). Anxiety is common in patients with cancer due to the stress that comes with the diagnosis. Patients with cancer also undergo multiple procedures that can be anxiety-inducing. It is important to search for effective interventions to help patients cope with this anxiety, as it has been known to have a negative impact during cancer treatments (Wong et al., 2020). For example, anxiety can potentially delay healing physiologically and increase hospital stay (Ahmad et al., 2020). This can have an especially negative impact on cancer patients. Cancer treatment can range from months to years. Chemotherapy, radiation, and other treatments are often recurring and can be anxiety-inducing. Anxiety can negatively impact cancer and cancer treatments because of its potential to add to the side effects of cancer treatment. Chemotherapy's side effects include fatigue, decreased appetite, dry mouth, changes in taste, hair loss, nausea and vomiting, and constipation (Altun & Sonkaya, 2018). Anxiety's side effects include nausea, shortness of breath, stomach pain, headaches, or shakiness (Harvard Health Publishing, 2020). The side effects of anxiety and chemotherapy can overlap, as seen in how they both can cause gastrointestinal-related side effects and can overall negatively impact the patient.

Anxiety is dealt with through many means such as anti-anxiety medications and distractions. An issue arising from the use of anti-anxiety medications is their adverse side effects. This is why other means such as distractions can benefit the patients more, since their side effects are not as extensive as those of medications. Distractions help to decrease anxiety,

and virtual reality is a new form of distraction with the potential to relieve anxiety (Glennon et al., 2018). Virtual reality is a new technology that creates a real-life-like immersion into a 3D environment (Birkhoff et al., 2021). The use of virtual reality as a nursing intervention is a potentially effective way of decreasing anxiety in patients with cancer. However, there is currently insufficient evidence and prior research regarding whether the use of virtual reality as a nursing intervention is correlated with decreased anxiety in patients, which constitutes a gap in the current knowledge.

The question this thesis aims to answer is what factors need to be evaluated in order to fill the knowledge gap and determine if a correlation exists between the use of virtual reality as a nursing intervention and decreased anxiety in cancer patients. This discussion will be supported by a literature study of two previous studies on the topic.

Aims and Objectives

Introduction

The thesis will address whether virtual reality used as a nursing intervention can decrease anxiety in patients with cancer. The goal is to address whether current research supports a reduction in anxiety in cancer patients when the use of virtual reality as an intervention is included in their treatment plan. Is there a correlation between virtual reality as an intervention and anxiety in cancer patients and, if not, what is needed to achieve a conclusion that a correlation exists? Investigation of previous studies will help work towards this goal.

Aims

1. To investigate previous studies on the use of virtual reality as a nursing intervention for anxiety in patients with cancer.

2. To determine if a correlation exists between the use of virtual reality as a nursing intervention and decreased anxiety in cancer patients.
3. To identify methods to fill the knowledge gap.

Objectives

1. Perform a literature review on previous studies on the use of virtual reality as a nursing intervention for anxiety in patients with cancer and their outcomes.
2. Determine if current research provides enough support for this intervention to be considered in evidence-based practice.
3. Develop recommendations for future research based on the identified knowledge gaps.

Methodology

Nursing articles about virtual reality as an intervention for anxiety will be found through the Cumulative Index to Nursing and Allied Health Literature (CINAHL) to ensure relevancy. Search terms will be generated through PICOT format (Melnyk & Fineout-Overholt, 2015). For PICOT, the population will be patients with cancer, the intervention will be virtual reality, the comparison will be those without virtual reality use, and the outcome will be its effects on anxiety. Search terms for the articles will include “virtual reality” and “cancer” and will be filtered to only include core nursing and research articles. Inclusion criteria for the literature review articles will be as follows: (1) quantitative primary article; (2) published within five years of the current year; (3) included cancer patients (4) published in the English language; (5) used virtual reality as an intervention; (6) focused on the effect of virtual reality intervention on anxiety. Exclusions will include secondary studies, thesis, and qualitative studies. Journals of the

articles will be then cross-listed using the Nursing Journal Directory from the International Nursing Academy of Nursing Editors (INANE) to ensure good quality.

IRB

This project does not involve human subject research and does not require IRB approval.

Outcomes

Specific outcomes include a conclusion on whether or not virtual reality intervention on patients with cancer facing anxiety has enough research. Specific outcomes also include figuring out what is lacking in research to help create a conclusion of if there is an inadequate amount. Through the review of the literature of multiple studies, addressing their p-value, and addressing where errors may occur, one can then address what is needed to fulfill the requirement to allow for a correlation to be made. Speculative outcomes may lead to research stemming from the findings to address these gaps in research, if any. Potential future research in this field could include different uses of virtual reality, such as interactive virtual reality (rather than video alone), and its use in different procedures. Personal outcomes include relation to nursing major as well as personal experience regarding cancers' effect on family members.

Review of Literature

Glennon et al. (2018) conducted a quasi-experimental study to evaluate virtual reality's effectiveness in alleviating anxiety. The intervention was conducted on adults from an outpatient cancer center undergoing bone marrow aspiration and biopsy procedures ($N = 97$). Participants were recruited through convenience sampling. One group served as the control, only receiving standard care ($n = 48$), while the other group served as the experimental, and received standard care and virtual reality intervention ($n = 49$). Virtual reality intervention included options of three

relaxing nature scenes with sound. The patients chose one of these videos prior to the procedure. The virtual reality intervention would then be utilized during the procedure. To measure anxiety, a five-item Likert-like scale, based on the scale implemented in Kindler et al. (2000), was used. This scale was then slightly modified to reflect this specific procedure. Glennon et al. (2018) measured anxiety before and after the procedure for both groups, scaling from 0 (*no anxiety*) to 4 (*very anxious*) with a Cronbach alpha of 0.7. During data analysis, researchers used T-tests and chi-square tests to compare the experimental and control groups on anxiety. Independent t-tests were used prior to the procedure to ensure groups were equivalent and were found to be not statistically significant ($p > .05$)[1]. The reliability of the anxiety tests was tested using Cronbach's alpha. The effect size was calculated using Cohen's d to ensure it regarded variables of interest. The overall result from the study found no statistically significant differences between the control and experimental groups ($p > .05$). It was also noted that 51% of participants, regardless of group, had a decrease in anxiety when comparing their pre- and post-measures of anxiety. A limitation of the study was the unaccounted alternate factors that could affect pre- and post-procedure anxiety level scores. Unaccounted factors include the patient's past experiences and the different providers. The virtual reality experience could have also been hindered due to the patient lying in a prone position, causing potential discomfort. Other virtual reality goggles issues included defective earphones and side effects of dizziness. It is also important to note that television is part of standard care for this procedure. Because of this, both groups were given some form of distraction, rather than only the experimental group with virtual reality. Television

[1] An error was found regarding the article's wording of the p-value.

and virtual reality are very similar since they both project images/videos, the only difference is that virtual reality makes that image/video immersive and look as though it were real life. This similarity could have led to the lack of difference between the two groups. This study's overall implications for nursing include advocating for nonpharmacological interventions for anxiety with minimal side effects for patients. Despite the nonsignificant results, it is important for nurses to learn more about other new noninvasive interventions that have the potential to benefit the patient.

Wong et al. (2020) conducted an experimental randomized control trial study on virtual reality intervention's effects on anxiety among pediatric patients undergoing peripheral intravenous cannulation (PIC) ($N = 108$). Participants were recruited using convenience sampling from a regional public hospital in Hong Kong. The participants were then placed into a control or experimental group through random allocation. Both groups have then also been split into two age groups (6-11 and 12-17). The generalized estimating equation (GEE) model was then used to measure the differences between groups. The control group received standard care ($n = 54$) while the experimental group received virtual reality and standard care ($n = 54$). The virtual reality intervention included sound and multiple video options, including museums, cartoons, and water worlds. The State Anxiety Scale for Children, with a 3-point Likert scale, was used to measure anxiety. Total scores from the State Anxiety Scale ranged from 10 (*low anxiety*) to 30 (*high anxiety*) and were taken pre- and post-PIC. The results showed virtual reality intervention to be statistically significant ($p < .001$). Limitations of the study include the recruitment process only including pediatric patients from one clinical setting and not including patients 6 years old or younger. A minor limitation was the fact that the study was not double-blinded, but it has been

noted that such a factor should not affect the study significantly. Nursing implications show the benefits of virtual reality as an effective distraction method. Virtual reality intervention can be a new way to manage anxiety in patients.

Mo et al. (2022) address issues through a systematic review and meta-analysis of studies on virtual reality as an intervention in healthcare. This quantitative article includes eight studies. In the review of the studies, the researchers found that people with terminal illnesses enjoyed the use of virtual reality. In the meta-analysis portion of the study, they found that the quality of evidence was low due to certain factors like small sample sizes and often no comparator arm. The article found that six of the eight studies were feasibility studies and had no control group; since virtual reality is new, there is no methodology specifically for the topic to allow for common factors between each study. As a collective whole of all the studies reviewed, the article comes to a similar conclusion that further high-quality research is required to offer definitive recommendations for clinical practice. Due to the different outcome measures of each study, the generalizability of the findings is limited. Because virtual reality is new and emerging it gives rise to its potential in many settings. Future studies need to be more rigorous in their designs and there needs to be a standardization on measures used for studies on virtual reality.

Discussion

Results across the two studies were inconsistent. The key differences between the studies were the procedure patients had to undergo and the age range sample used by Glennon et al. (2018) and Wong et al. (2020). One regarded a pediatric population, while the other regarded adults. Glennon et al. (2018) had a limitation regarding the unaccounted factor of participants' previous experiences, which could have led to no statistically significant results. Studies such as

the pilot study of Birkhoff et al. (2021) focused on the effect of virtual reality on anxiety in adult patients undergoing their first chemotherapy and had statistically significant results. Unlike Glennon et al. (2018), this was the patients' first-time experience with the procedure. Discounting this factor may alter results due to the inclusion of potentially desensitized participants, which may influence their anxiety levels. Wong et al. (2020) had fewer limitations, with their largest limitation being unable to include younger patients. The only other limitation stated was a variable that would not affect the results either way. Wong et al. (2020) overall had a stronger study since it was a randomized control trial. In regards to the systemic review of Ahmad et al. (2020), it included thirteen different studies on virtual reality used for anxiety relief, all thirteen studies' results concluded that virtual reality was effective in reducing anxiety in younger and older patients when compared to their control groups. This systematic review is consistent with Wong et al. (2020) and shows that despite the nonsignificant results of Glennon et al. (2018), virtual reality intervention still has the potential to produce an effect on anxiety as seen with the other studies.

The studies also shared similarities. They had both implemented virtual reality interventions that encompassed multiple calming scenes patients could choose from. Both used a Likert-like scale for their measurements, but it should also be noted that Wong et al. (2020) used the State Anxiety Scale for Children due to their pediatric population. Both also brought new information on virtual reality intervention and its use in different environments. The body of evidence presented by Glennon et al. (2018) showed that virtual reality may not be best for all environments. This is seen with how patients' position and comfort during the bone marrow aspiration and biopsy procedure may affect the intervention's effectiveness. The body of

evidence of Wong et al. (2020) showed that virtual reality can be implemented on younger patients with cancer. Ahmad et al. (2020) further enhanced the meaning behind the body of evidence of Wong et al. (2020) by including studies encompassing pediatrics and older patients, showing that the results were statistically significant despite age.

Mo et al. (2022) addressed multiple studies as a collective whole and highlighted similar issues found in Glennon et al. (2018). Mo et al. (2022) also found similarities between Glennon et al. (2018) and Wong et al. (2020) in the eights studies that were reviewed.. Mo et al. (2022) found that because of the lack of standardized approaches to studies on virtual reality in the healthcare setting the generalizability of findings in the studies was reduced. Studies had various ways to measure virtual reality as an intervention. Both Glennon et al. (2018) and Wong et al. (2020) used different ways to measure the effectiveness of virtual reality and varying approaches and parallels the eight studies reviewed by Mo et al. (20233).

Glennon et al. (2018) show a common issue found in studies regarding virtual reality that leads to the study being statistically significant. The systemic review and meta-analysis of Mo et al. (2022) found that many articles on virtual reality used in healthcare settings often lack rigor in their study. The lack of rigor can lead to extraneous factors not being taken into account such as patients' desensitization to pain mentioned in Glennon et al. (2018). Glennon et al. (2018) also had an environment that was less controlled compared to procedures that do not use television as standard practice.. The situation presented by Glennon et al. (2018) was not optimal because the control group had access to television since it is standard practice for such a procedure. The use of television for the procedure is standard practice and is a form of distraction, similar to virtual reality. The similarity between television and virtual reality make it less optimal for comparison.

Both studies parallel the findings of Mo et al. (2022) on the type of research available about virtual reality in a healthcare setting; Glennon et al. (2018) and Wong et al. (2020) focusing on specifically patients with cancer. There are many ways that virtual reality is studied, often due to this lack of common methodology for approaching the topic and a lack of rigor. All in all, between the three articles, they conclude that more higher quality research is needed.

Nursing Implications

When assessing a patient with cancer for anxiety, key signs and symptoms may include restlessness, decreased motivation, irritability, agitation, and muscle tightness (Holman et al., 2019). When anxiety is on severe or panic levels, inability to function, ritualistic behavior, loss of rational thought, and immobility may occur. Anxiety is a normal response, but if prolonged, can become maladaptive (Holman et al., 2019). The population of cancer patients would likely be diagnosed with anxiety related to stressors, due to the extensive treatment and procedures they may undergo (Ackley et al., 2017). When planning for the management of anxiety, relaxation techniques, group therapy, and a therapeutic milieu may be used. Virtual reality could be considered a relaxation technique since it is a form of distraction (Ahmad et al., 2020). During planning, the nurse may consider the type of video and/or the type of virtual reality experience. This may include nature videos and/or any relaxing scenes projected using virtual reality goggles (Bikhoff et al., 2019; Glennon et al., 2018; Wong et al., 2020). Once planning has finished, such interventions are put in place. This is when the patient would experience virtual reality and use the virtual reality headset to distract them from anxiety. As time progresses the nurse will then reassess and evaluate if the interventions were successful (Holman et al., 2019). Evaluation of

anxiety may include Likert-like scales, such as the State Anxiety Scale for Children (Wong et al., 2020).

The Gap in Knowledge

Although there are existing studies that are statistically significant regarding the use of virtual reality as an intervention for anxiety in patients with cancer, there are also many studies that are not statistically significant due to limitations. Wong et al. (2020) demonstrate a highly rigorous study that has a statistically significant outcome while Glennon et al. (2018) show how studies may not be statistically significant due to certain factors and limitations. Mo et al. (2022) highlight the key issues in the study of virtual reality in the healthcare setting and find studies of Wong et al. (2020) and Glennon et al. (2018) are common themes in these types of studies.

Common themes in virtual reality studies in healthcare include different methods of measurement for the effectiveness of virtual reality. Despite common themes such as Likert-like scales used in studies, there is no common methodology for assessing virtual reality as a whole. A common methodology in assessing virtual reality's effectiveness is important since it will allow for common ground between studies. The lack of homogenous outcome measures, study designs, and the type of equipment used also play a role in why studies using virtual reality as an intervention in decreasing anxiety in patients with cancer are not effective in concluding if virtual reality is effective (Mo et al., 2022). Studies available are not effective because of this limit in the generalisability of the findings; available studies are also insufficient in creating a strong correlation between virtual reality and anxiety. Although there may be studies that can draw a statistically significant result, a study must be replicable and show consistency for the

findings to be sufficient enough to conclude whether virtual reality is effective in decreasing anxiety.

To address this gap in the lack of available research, there needs to be more high quality research and studies done with common measures, study designs, and equipment. Because virtual reality is a new and emerging form of technology in the healthcare setting, there is also simply a lack of available studies.

Common measures between studies would allow researchers to compare findings to discuss results. This can also be applied to other healthcare topics using virtual reality as a part of their study. Common measures allow for a common standard to be used to allow for better communication between studies on the use of virtual reality as an intervention. Similar ideas apply to why study designs are important. In regards to the use of common equipment, it will create a better understanding of the limits and ability of the virtual reality headset used; different headsets have different limitations on their ability to perform certain tasks. Some virtual reality headsets may perform better than others and be more immersive, while others may not be as advanced. The differences that can arise from using different variations of virtual reality headsets decrease the ability to generalize findings between studies.

Conclusion

Research regarding the use of virtual reality as a nursing intervention for anxiety in patients with cancer is insufficient to conclude whether or not virtual reality is effective. Due to virtual reality's potential in healthcare, specifically as an intervention to decrease anxiety in patients with cancer, it is important to continue expanding research on it. Because it is new, it is also important to create a common method in studies regarding virtual reality as well as common

designs, and equipment to allow for more generalizability of findings. As more studies emerge on the use of virtual reality, and with more rigor, a stronger correlation can be created to address whether virtual reality is a viable intervention in decreasing anxiety.

Biographical Note

My name is Micaela Joi Terrado Espedido and I am a student at Oakland University majoring in Nursing. I am part of the Honors College and am a member of the Student Nurses Association of Oakland University (SNAOU). My future goals are to work in the Intensive Care Unit (ICU) as a nurse and become confident in care for patients in critical condition. The creation of this thesis is in hopes of finding different interventions to utilize in practice for better patient outcomes. As a student nurse, I have taken multiple internships to better prepare for becoming a registered nurse. Preparation includes becoming an intern on an oncology floor for six months and currently working at an ICU for more than eleven months.

I have always been very driven to provide the best care I can for the most critical patients. It is my goal to ensure that my patients feel that they are receiving the best quality of care and that they are assisted beyond their medical diagnosis.

Time on the oncology floor and personal experience drove me to write on this topic. My mother has ovarian cancer and her experience has motivated me and brought to light the need for interventions that are not medication-related. My mother has multiple medications which often give her side effects; at times my mother would ask me to use my virtual reality set to relax and use it to do some yoga. Noticing this, I realized the potential for new technology, like virtual reality, as a distraction for those with anxiety. As a nurse I always for the best patient outcomes and understanding diverse groups, I have worked as a mentor for the Center for Multicultural Initiatives Office and the Gender and Sexuality Center Office at Oakland University. I have a strong belief in the importance of hearing and learning about people's experiences and exposure to culture to better understand people's backgrounds.

My overall goals for the future are still emerging and changing. I plan to take life one step at a time and to make sure I do the best quality of work and care as I grow as a nurse. For now, I plan to take the licensure exam for registered nurses and wish to continue working in the ICU where I strive to be as prepared as I can for the most critical patients. Another goal is lifelong learning, including seeking out opportunities and keeping up with evidence-based practice. I plan to obtain my ACLS and eventually become a CCRN via exam.

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