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Virtual Reality Distraction Therapy: A Pilot Study Improving Patient Satisfaction in the PACU

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Abstract

Background: The post anesthesia care unit (PACU) is designed to maintain clinical stability and ensure patient comfort. Failure to optimize these goals delays PACU discharge, consumes resources, and impairs patient satisfaction and healthcare perceptions. Virtual reality (VR) distraction therapy may provide an additional modality to reduce pain and audiovisual annoyance.

Methods: Patients were randomized to either receive virtual reality therapy (treatment arm) or not (control) in the PACU. Patients completed a survey measuring outcomes at baseline upon entering PACU and upon discharge from PACU. Scoring included pain, unpleasantness, visual analog scale (VAS) score, any fun experienced and time spent thinking about pain before and after the intervention.

Results: Baseline scores upon entry to the PACU before group assignment was revealed were not statistically different. Median initial pain and unpleasantness levels were low given the procedures investigated. Environmental unpleasantness perception changed for the better in the VR group, as did time thinking about fun. The other groups did not provide reliable evidence of change.

Conclusion: Virtual reality distraction therapy improves patient satisfaction in the PACU. Further exploration into other perioperative sites may show similar changes in satisfaction and potentially decreased pain.

MeSH Keywords

Virtual reality [E02.831.740], Distraction techniques [E02.831.350.500], Postanesthesia care units [N02.278.421.968], Patient satisfaction [F01.829.316.124.500], Anesthesia recovery period [E03.155.606.400.040], Pain management [C23.888.592.612.798]

ICMJE Data Sharing Statement

The data that support the findings of this study will be made available by the corresponding author upon reasonable request. Deidentified individual participant data (including data dictionaries) will be shared beginning 6 months and ending 2 years following article publication. Researchers must provide a methodologically sound proposal and a signed data use agreement. Data will be shared for the purpose of academic research and verification of study findings only. No additional documents (such as the study protocol or statistical analysis plan) will be made available.

Introduction

The condensed goal in the post anesthesia care unit (PACU) is to maintain clinical stability, establish adequate analgesia, and optimize patient satisfaction. Patient perception and experience are increasingly recognized as critical measures of performance. This has grown into a quality measure that impacts hospital systems financially and perceptually [1]. Other clinically benevolent strategy posits that improved patient experience will improve compliance with care and

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decrease hospital avoidance and/or phobias [2]. Dissatisfied patients, particularly in preventative care realms subject to personal or social unease (e.g. surveillance endoscopy), are more apt to switch providers or cease cooperation with elective procedures altogether [3,4].

Inadequate post procedural pain control decreases patient satisfaction, expends medical resources, and limits patients' ability to recover and resume normal activity [5]. Pain medications are among the most widely prescribed drugs in the US costing approximately 17.8 billion USD annually [6]. Opioids are a part of the armamentarium for post-surgical pain but come with a host of side effects ranging from acute respiratory depression to long-term dependence and abuse. Opioids become less efficacious over time with increasing incidence of opioid induced hyperalgesia in patients chronically exposed [7]. With an ever-increasing burden on health care there has been a surge in identifying alternative strategies like non-opioid pharmacological agents, regional nerve blocks, and non-pharmacologic strategies.

Virtual reality (VR) as an alternative modality to treat pain has been gaining interest over the previous two decades. While the concept of distracting someone to temporarily alleviate pain has been described, its practice in the field of medicine to treat acute and chronic pain is relatively new with unknown scope of its utility. Distractions in the form of television and video games have been used in children to allay fear and anxiety during medical procedures [8,9]. VR can distract patients from pain during physical therapy [10]. Immersion is a unique feature of VR, which engages and enhances the operator's sensory experience. The illusions enable participants to respond to auditory, visual, and tactile stimuli from the virtual environment. The perception of pain requires attention and VR redirects this attention away from the real world, preventing the processing of pain signals arising in the real world [9]. Prior investigation found improved analgesia when VR was combined with standard of care [11,12,10].

Prior reporting on VR technology as an adjunctive pain therapy has not extensively involved the perioperative or post anesthesia realm. VR technology deployed in a PACU setting is an exciting prospect that could decrease narcotic consumption or improve patient satisfaction in the post-operative period and enable faster recovery. The purpose of this study is to begin to explore the effect of VR in the PACU. Statistical significance could provide evidence for expanded use in more procedural locations with varying degrees of surgical intervention and anesthetic exposure.

Materials and Methods

Study design

This study was approved by the IRB at Hahnemann University Hospital. In this prospective study, after obtaining written informed consent, 101 (38 control vs 63 VR group) ASA I, II or III patients, between the ages of 18-50 years, were enrolled into the study over a period of 12 months. Patients with a diagnosis of chronic pain, migraines, complex recovery period, or those directly transferred to intensive care were excluded from the study. Patients were randomized to either receive virtual reality therapy (treatment arm) or not (control) in an endoscopy PACU. Participants were randomized using a computer-generated randomization sequence to ensure an unbiased assignment of individuals to the intervention and control groups. The randomization sequence was generated independently from those involved in the enrollment or intervention process.

To implement the random allocation sequence, sequentially numbered, opaque, sealed envelopes were prepared. Each envelope contained the assigned group allocation and was opened only after a participant provided written informed consent and completed baseline assessments. This ensured allocation concealment and minimized the risk of selection bias.

Once the patient was considered alert and hemodynamically stable, the treatment group was given a VR headset to wear. The platform used for VR was a soft and lightweight headset into which a smartphone was inserted. The mobile phone served as the hardware displaying the VR program and disposable earbuds were provided for a more immersive audiovisual experience. No patients received any additional medication once they reached the PACU. The VR was discontinued once they were deemed ready for discharge. At the end of the VR experience, all patients completed a survey measuring outcomes, which included pain, unpleasantness, VAS score, any fun experienced and time spent thinking about pain before and after the intervention. The outcomes selected originated from typical endpoints investigated in prior VR clinical studies [12-15].

Statistical methods

After obtaining basic descriptive statistics on the two groups, the main comparisons were done via nonparametric tests (specifically Mann-Whitney U tests) since many of the variables were very non-normally distributed (typically numerous 0's, 1's, and 2's but also a few 9's and 10's).

Results

There was no statistically significant difference between the VR and control groups on age, ASA status, or gender, but time in the PACU averaged lower in the VR group (Table 1). The groups did not differ on any of the key clinical outcomes at baseline. Median pain and unpleasantness levels were very low even in the absence of any treatment. Outcome variables at baseline upon entry to the PACU before group assignment was revealed were not statistically different (Table 2). Environmental unpleasantness perception changed for the better in the VR group, as did time thinking about fun. The other groups did not provide reliable evidence of change (Table 3).

Discussion

The operating room is a place of great anxiety for many patients. Post-operative recovery can be compromised by a myriad of factors including fears about anticipated pain, being in foreign vulnerable settings, disruptive alarming monitors, and clinical personnel. Extended PACU and hospital stays

Table 1: Demographic and clinical comparisons between the VR and control groups. Data are median (IQR) or N (%).

	Control	VR	p
Age (years)	39 (32-45)	39 (28-47)	0.660
ASA	1 (1-2)	1(1-2)	0.730
PACU times (min)	20 (15-25)	15 (13-20)	0.011
Female Gender	26 (68%)	33 (52%)	0.114

Table 2: Outcome variables at baseline/entry to the PACU. Data are median (IQR)

	Control	VR	p
Environment/Unpleasantness	2 (1-3)	2 (1-3)	0.614
Worst Pain	1 (0-3)	1 (0-2)	0.594
Time thinking about pain	1 (0-2)	1 (0-2)	0.650
Thinking about fun	2 (0-4)	1 (1-3)	0.412
Visual Analog Pain Score	0 (0-1.25)	1 (0-2)	0.393

Table 3: Drop/rise in outcome variables at end of PACU stay. Data are median (IQR)

	Control	VR	p
Environment/Unpleasantness: Drop	0 (0-1)	1 (0-2)	< 0.001
Worst Pain: Drop	0 (0-1)	0 (0-1)	0.100
Time thinking about pain: Drop	0 (0-0)	0 (0-1)	0.410
Thinking about fun: Rise	0 (0-0)	5 (3-7)	< 0.001
Visual Analog Pain Score: Drop	0 (0-0)	0 (0-1)	0.077

are associated with higher health care costs and decreased patient satisfaction. Improving patient satisfaction can clearly improve the quality of care [16]. One goal of this study was to determine if using VR in the postoperative setting can help alleviate some of the anxiety and stress associated with surgery and improve the patient experience. In the particular setting investigated, VR has a role to play for improving outcomes despite an absence of improved analgesia specifically.

The patient experience was enhanced with the use of VR distraction therapy and the patients had more positive thoughts and an increased perception of fun. Overall, in a high-volume surgical setting where staff and resources are limited, utilizing a cost-effective strategy to positively pivot the viewpoint of surgery is progressive, contemporary, and advantageous. While not investigated statistically, it is noted the majority of patients introduced to this VR application was met with curiosity and intrigue. This, in a setting otherwise governed by complaints about bowel prep, logistical complications, and anxiety towards procedure or anesthesia. The change in attitude for the patients involved was not only statistically measurable, but visibly apparent.

Literature demonstrates increased cost associated with extended postoperative recovery [17,18]. Patients in the control group had longer PACU stays compared to those patients utilizing VR distraction therapy. Although the surgical population was undergoing low acuity procedures that lend themselves to lower narcotic use and shorter recovery time, there still appears to be a role for VR. Future studies involving significant surgical procedures with more extensive PACU stays may continue exhibiting this trend.

This pilot study demonstrates the feasibility of delivering VR distraction therapy in the immediate post-procedure setting, even in a high-throughput PACU environment. The results suggest that VR may improve the subjective experience of recovery, not necessarily through analgesia but via cognitive-emotional modulation of environmental perception. These findings are consistent with literature suggesting that attentional redirection, even for a brief period, may reduce psychological stress and improve patient-reported satisfaction metrics.

We acknowledge several limitations. As a pilot study, our primary goal was to test the operational viability of VR delivery rather than to produce definitive outcome data. Our sample size was not based on power calculations and may be underpowered to detect subtle clinical effects. In addition, our outcomes relied on brief, non-validated surveys rather than standardized instruments for assessing patient satisfaction or emotional recovery. This limitation may have contributed to ambiguous interpretation of certain endpoints. Furthermore, the lack of standardized PACU discharge criteria introduces potential bias in interpreting time-to-discharge as a functional outcome.

The case mix in our study consisted exclusively of low-acuity endoscopic procedures with minimal expected postoperative pain. This likely limited the ability to detect changes in pain-related endpoints and restricts generalizability to higher-acuity surgical populations. However, this also underscores the potential relevance of VR in outpatient or ambulatory surgery settings, where efficiency and patient satisfaction are key quality drivers.

Given these considerations, our findings should be interpreted as preliminary. Nonetheless, they highlight several directions for future investigation. A more rigorous, adequately powered trial using validated instruments and standardized discharge protocols is needed to clarify the clinical utility of VR in diverse surgical populations. Future work should also explore the impact of different VR content types (e.g., nature-based, meditative, interactive) and duration of exposure on recovery experience and measurable clinical outcomes such as analgesic use, length of stay, and satisfaction scores. Understanding the cognitive and emotional dimensions of postoperative recovery will be essential to designing patient-centered perioperative environments.

In conclusion, our study supports the feasibility and potential benefit of VR distraction therapy in the PACU setting, particularly as a strategy to improve environmental perception and emotional recovery after minor procedures. While effects on pain were not demonstrated in this cohort, the observed changes in subjective experience and PACU duration warrant further study in broader surgical populations. As healthcare systems seek scalable, low-cost interventions to enhance patient-centered care, VR may represent a valuable addition to the perioperative toolkit.

Previous Presentations

Not applicable.

Conflicts of Interest

The authors' report no conflicts of interest including commercial relationships, consultation arrangements or equity interest.

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Research Registration Number

Not applicable, the trial does meet the National Institute of Health/National Library of Medicine (ClinicalTrials.gov) definition of an Applicable Clinical Trial (ACT) that is required to be registered under 42 CFR 11.22.

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