A Pilot Randomized Controlled Trial to Assess the Feasibility of Administering an Augmented Reality in Pediatric Oncology Patients Undergoing Surgery

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BACKGROUND

The treatment of acute postoperative pain can be challenging, and it can negatively impact the quality of life (QoL) of pediatric patients with cancer. Therefore, there is a need for novel non-pharmacological interventions that can contribute to reducing opioid use and facilitating postoperative pain. Augmented reality (AR) superimposes virtual reality images onto real-world objects using existing mobile devices. In a randomized controlled trial, AR reduced pain scores by >2 fold in pediatric burn patients undergoing wound dressings.

PURPOSE

The objective of this multicenter randomized clinical trial was to assess the feasibility of using a digital augmented reality (AR) scavenger hunt game in pediatric oncology surgery patients.

METHODS

After obtaining IRB approval, eligible participants with a confirmed diagnosis of solid malignant tumors requiring surgery, ages 3-18 years, and no opioid use within 30 days of surgery were enrolled. Patients with a history of peripheral neuropathy or cognitive impairment were excluded. The primary outcome of this pilot trial was to assess the feasibility of AR-enabled scavenger hunt use after cancer surgery. Secondary outcomes include inpatient and rate of 90-day postoperative outpatient opioid use, average daily inpatient pain score, QoL, ambulation, and patient experience. Patients were randomized 1:1 to AR or non-AR groups. Both groups received routine pain management.

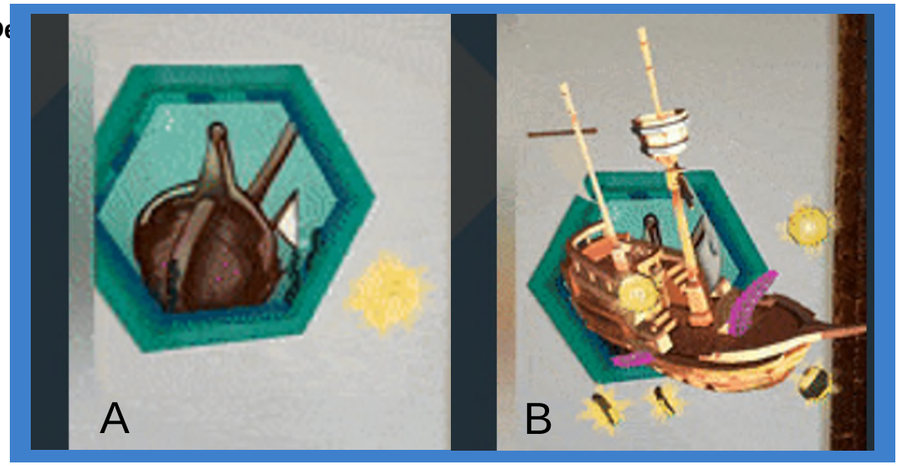

Fig 1: Wall Decal before (A) and after (B) activation using iPad

Outcomes		AR (n=9)	No-AR (n=10)	P value
POD 0				
Augmented reality activation		9 (100%)	NA	
Pain intensity - 5 pm		3.5 [1 – 4.5]	4 [1 – 6]	0.67
Opioid use	No Yes	2 (22.2%) 7 (77.8%)	6 (60%) 4 (40%)	0.169
Opioid consumption MEDD		2 [0.2 – 5.53]	1.4 [0.45 – 2.48]	0.85
Number of times out of bed		0.5 [0 – 1]	1 [1 – 1]	0.582
Number of targets activated		1.5 [0 – 3]	1 [1 – 1]	1.000
POD 1				
Pain intensity - 9 am 5 pm		2 .5 [0.5 – 4.5] 3 [1 – 4]	4 [2 – 5] 3 [2 – 4]	0.472 1.000
Opioid use	No Yes	3 (37.5%) 5 (62.5%)	4 (40%) 6 (60%)	1.000
Opioid consumption MEDD		12.67 [5.6 – 13.33]	2.7 [2 – 3.96]	0.315
Number of times out of bed		4 [2 – 7]	3 [1.5 – 5]	0.556
Number of targets activated		3 [0 – 5]	0.5 [0 – 2]	0.082
POD 2				
Pain intensity - 9 am 5 pm		2 .5 [0.5 – 4.5] 3 [1 – 4]	4 [2 – 5] 3 [2 – 4]	0.385 0.704
Opioid use	No Yes	2 (33.3%) 4 (66.7%)	3 (37.5%) 5 (62.5%)	1.000
Opioid consumption MEDD		3.07 [1.77 – 6.8]	4 [1-7.5]	1.000
Number of times out of bed		3 [2 – 3]	3.5 [1 – 5]	0.771
Number of targets activated		1 [0 – 3]	0 [0 – 0]	0.048
Discharge				
Opioid use	No Yes	2 (22.2%) 7 (77.8%)	6 (60%) 4 (40%)	0.169
Opioid prescribed MEDD		18 [7.5 – 20]	0 [0 – 10]	0.05
Length of stay		2 [1 – 4]	2.5 [2 – 4]	0.556
Quality of life score		100 [75 – 100]	75 [75 – 100]	<0.001
90 day follow up				
Pain intensity		0 [0 – 0]	0 [0 – 0]	1.000
Opioid use	No Yes	9 (100%) 0 (0%)	9 (90%) 1 (10%)	0.343
Opioid prescribed MEDD		0 [0 – 0]	0 [0 – 0]	0.343
Quality of life score		100 [100 – 100]	75 [75 – 87.5]	<0.001

MEDD: Morphine equivalent daily dose

Table 1: Postoperative Outcomes

RESULTS

- 20 patients were enrolled (9 AR/10 non-AR)
- 1 patient was excluded secondary to consent withdrawal
- No significant differences in variables were found except for a slightly higher QoL score in the AR group
- Postoperatively, all AR patients successfully activated the game.
- Inpatient postoperative variables were not statistically different (Table 1).
- Patients in the AT group reported the technology was "fun" (77.8%), "motivated them to get out of bed" (66.7%) and found ease with target activation (100%).
- The postoperative QoL scores remained higher in the AR group throughout the study (Table 1).

CONCLUSION

Our study demonstrates the feasibility of delivering an AR scavenger hunt game in the postoperative period of pediatric patients undergoing oncological surgery. A larger randomized controlled study will determine the efficacy of the AR digital scavenger hunt game on postoperative pain intensity, opioid use, and QoL after pediatric cancer surgery.

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