Abstract

Virtual Reality in Mechanical Ventilation Weaning After Spinal Cord Injury

Jaye Hefner*, MD MPH; Kevin O'Connor*, MD; David Binder*, MD MBA

Spaulding Rehabiliation Hospital, Harvard Medical School, Department of Physical Medicine and Rehabilitation, Boston, MA, United States

*all authors contributed equally

Corresponding Author:
Jaye Hefner, MD MPH
Spaulding Rehabiliation Hospital
Harvard Medical School
Department of Physical Medicine and Rehabilitation
Boston, MA,
United States
Phone:
Email: jhefner@mgh.harvard.edu

Abstract

Background: Traumatic spinal cord injury (SCI) represents an injury with devastating sequelae and limited treatment options, affecting 12,000 new patients every year in the United States. Less than 1% of patients have complete recovery at hospital discharge. Complete spinal cord Injury at and below cervical level 4 have intact diaphragmatic function and while they may initially require ventilator support post-injury, they are usually able to wean from the ventilator. The survival rate for these seriously ill ventilated patients has increased dramatically over the past several decades by utilizing resistance and endurance training with progressive ventilator free breathing protocols. Ventilator free endurance training can be adversely impacted by patient anxiety, depression and pain which are some of the most problematic consequences of spinal cord injury. If unattended, they can have an omnipresent and deleterious impact upon rehabilitation and perceived quality of life. The use of virtual reality (VR) has recently been examined in hospitalized, non-spinal cord injured patients as a complimentary tool for the management of anxiety, depression, and pain. The use of virtual reality technology as an aid to facilitate patient engagement and satisfaction with mechanical ventilation weaning in the spinal cord injury population has not been previously studied.

Objective: The objective of this study is a proof-concept to propose specific use case data and experience to determine the value of utilizing VR technology in the SCI patient population who are undergoing ventilator free endurance training while participating in a ventilator weaning protocol. We sought to gain feedback and experience from patients participating in endurance training who trialed VR during the wean period.

Methods: Patients with an SCI complete C4 level or below who were admitted to Spaulding Rehabilitation Hospital (SRH) for mechanical ventilation weaning were asked to trial public-domain VR content during their ventilator free endurance training protocol time. VR content was displayed on a Samsung Galaxy 7S using a Samsung Gear VR powered by Oculus. Patients with open cranial wounds, traumatic brain injury, seizure disorder and ocular injury or deficit were excluded. Patients were queried for any adverse effects or feelings, satisfaction, interest and engagement.

Results: Ten patients voluntarily trialed public-domain VR content during their ventilator free endurance training protocol time. No patient reported feeling claustrophobic or nauseated with the VR content. One patient reported experiencing nightmares but did not associate this with the VR experience. All patients expressed positive feelings of their immersion experience through VR. All patients expressed a sense of well-being associated with their VR experience and asked to have VR be part of their rehabilitation experience.

Conclusions: VR can be successfully incorporated into the ventilator free endurance training protocol of SCI patients in the acute rehabilitation setting. We suggest additional research and validation of VR technology in mechanical ventilation weaning in the SCI population.

(iproc 2017;3(1):e2) doi: 10.2196/iproc.8707

KEYWORDS

anxiety; pain; usability testing; user experience evaluation; virtual reality

Edited by T Hale; this is a non–peer-reviewed article. Submitted 10.08.17; accepted 25.08.17; published 21.09.17.

Please cite as:
Hefner J, O'Connor K, Binder D
Virtual Reality in Mechanical Ventilation Weaning After Spinal Cord Injury
iproc 2017;3(1):e2
URL: http://www.iproc.org/2017/1/e2/
doi: 10.2196/iproc.8707
PMID: