

# Comparison of Standard Home Education Program with Customized Technology Assisted Program for Respiratory Rehabilitation in Spinal Cord Injury Patients

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## Abstract

**Introduction:** Therapeutic patient education (TPE) serve as an aid to the patient in learning and developing numerous competencies, adapting behaviours, thereby, leading to an improvement of different health parameters such as pain relief, faster recovery and improved quality of life TPE is in existence 30 years and numerous studies have demonstrated its efficiency. Various methods have been employed for providing TPE to patients.

**Objective:** Patient education (PE) has been discovered to be critical in SCI. In order to prevent and reduce the chances for further progression of SCI, patient education (PE) is considered to be of great influence. Proper care can further reduce the burden of re-hospitalization and cost penalties. Our study aimed at analyzing patient satisfaction and improvement of patient education and rehabilitation in two modes of home based patient education, one is the conventional method and the other is technology assisted. To improve PE, we hypothesize that tailoring and customizing technology assistance in the PE program will leads in better results.

**Setting:** Indian Spinal Injuries Centre, Vasant Kunj, New Delhi, India.

**Methods:** A total of 60 SCI survivors were scrutinized on the basis of inclusion and exclusion criteria from Indian Spinal Injuries Centre and divided them into two groups (TARP and Conventional with 29 and 31 participants respectively) and weekly telephonic feedback was taken and noted on feedback and patient satisfaction and compliance questionnaire. Statistical analysis was performed with Chi-square and one-way ANOVA to examine the responds of the subjects towards their corresponding mode of home rehabilitation program.

**Results:** In our study, technology assisted exercise program (TARP) wasn't rated better than the conventional home based method. It however, showed improvements in terms of compliance of duration (p-value of 0.019) and feedback (p-value of 0.004).

**Conclusion:** In a nutshell, our study suggested that video assisted exercise program (TARP) in patient education was not rated better than routine method of patent education by the patients undergoing rehabilitation. However, the TARP group showed significant improvement in duration of exercise and treatment compliance and better feedback towards mode of exercises given for home care program. Regular follow up improves the adherence towards the rehabilitation and exercise based treatments.

**Keywords:** Respiratory rehabilitation, Dyspnea, Patient Education, Technology assisted rehabilitation program, Compliance, Feedback

## Introduction

Traumatic or non-traumatic spinal cord injuries (SCIs) can result in lifelong neurological deficits such as quadriplegia or paraplegia. If the injury interferes with daily activities, physical and occupational therapy will be needed for the duration of the injury.

Respiratory symptoms like impaired cough, secretion retention makes the person more prone to getting infections in SCI survivors in the acute or early stages of their injury, depending on the severity of their injury. People with spinal cord injuries continue to be marred by respiratory problems, which are a leading cause of morbidity and mortality. People with SCI benefits from respiratory muscle training because it improves their respiratory muscle strength and endurance. When used as an intercession to improve inspiratory muscle strength, breathing exercises has the potential to reduce dyspnea and respiratory diseases in certain individuals with SCIs.<sup>(5)</sup>

There must be follow-up care, including regular doctor's appointments, receipt of treatment records, and preventive screening. Receiving follow-up care increases your chances of a successful outcome, prevention of life-threatening complications, recurrence of symptoms, and co-morbidities.<sup>(6)</sup>

TPE defines the various skills that patients with chronic diseases should be taught, as well as the content and structure of several TPE programs ranging in complexity. Therapeutic Patient Education (TPE) enables people with chronic diseases to manage their illness and provides benefits in both health and financial terms. However, many health care providers lack the necessary skills to provide such an education to their patients.<sup>(7,8)</sup> These instructions are generalized and usually are in tabulated form. Thus, patient finds them difficult to comprehend and most of the times lose interest quite often leading to poor outcomes. Hence, we are trying to incorporate the use of technology and give audio-visual instructions to the SCI patients for their better complained exercise outcome and good rehabilitation practice.

## Materials and Methods

This quasi-experimental study was conducted after Institutional Ethical and Review Committee approval from Indian Spinal Injuries on people who underwent Spinal cord injury. It was registered with reference no. ISIC/RP/2021/13. A total of 60 SCI survivors were distinguished on the basis of inclusion and exclusion criteria from Indian Spinal Injuries Centre and were categorised into two groups, namely, the Technology assisted rehabilitation patients (TARP) and the conventional group with 29 and 31 patients respectively. Weekly feedback was taken and noted via telephone and feedback and patient satisfaction and compliance questionnaire. Statistical analysis was performed with Chi-square and one-way ANOVA to examine the responds of the subjects towards their corresponding mode of home rehabilitation program.

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>• Incomplete SCI patients who are getting discharged for the first time.</li> <li>• Patients those who can comprehend Hindi and English and follow the instructions.</li> </ul>	<ul style="list-style-type: none"> <li>• Patient with associated head injury.</li> <li>• Patient having language issues.</li> <li>• Unavailability of android or other competent phones.</li> </ul>

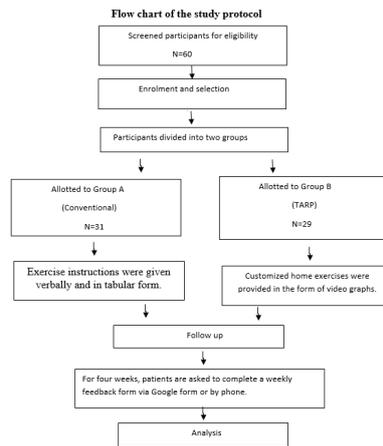
## Participants Demographics, Grouping, and Setting up the questionnaire

The eligible participants were given an extensive explanation of the study and were asked to provide written informed consent for the study. After giving their consent, they were told about the study's purpose and asked to complete weekly questionnaires via telephonically for four weeks after being discharged from the hospital. On the basis of convenient sampling, patients were divided into two groups for the study: Group A (Conventional) and Group B (TARP). The subjects in the TARP Group were then given customized home exercises in video-graph form, which included upper limb exercises, lower limb exercises, diaphragmatic breathing exercises, and thoracic ROM exercises, whereas the subjects in the Conventional Group received generalized verbal and tabular instructions for the same set of exercises.

## Treatment mode Related Feedback and Patient satisfaction and compliance Outcomes

The survey questionnaire was comprised three sections (patient demographics, Dyspnea assessment scales mBorg and VAS and patient feedback and compliance questionnaire), and subjects were informed about the study's secrecy and confidentiality. The feedback form is used to assess respiratory strength and breathing status, dyspnea level satisfaction and compliance. On various items, patients were asked to complete a likert scale for compliance and feedback as per their mode of rehabilitation. Weekly feedback form is obtained from the patients via Google form or telephonically for 4 weeks. A video chat session is there for tracking and follows up. As shown in the pictures.

Flow chart of the study protocol



Results

The study comprised of 60 SCI survivors and divided into two groups. The results were analyzed in parts to check whether these groups are different at demographic levels and further to evaluate them on the basis of treatment evaluation scale and patient satisfaction and compliance level of the studied population.

**Demographic profile:** The average participant age was 35.60 with S.D of 15.410 years and 31.7% were females. The numbers of uneducated participants were 3 and 8 in the TARP and conventional group respectively. High School graduate participants were 14 and 11 in the TARP and conventional group respectively and there were 12 and 22 graduate participants in the TARP and conventional group respectively.

**Table 2.** The below table shows number of participants divided on their demographic information, age, gender, education and level of injury.

	TARP (n=29)	Conventional (n=31)	Total (N=60)
Age (in years) (Mean ± S.D.)	38.40 ± 17.944	32.80 ± 12.038	35.60±15.410
Gender Frequency (%)	24 (male) (83.3%) 5 (female) (16.7%)	16 (male) (53.3%) 15 (female) (49.7%)	40 (male) (68.3) 20 (female) (31.7)
<b>Educational status</b>			
Illiterate	3 (10%)	8(26.7%)	11(18.3%)
High School	14 (48.2%)	12 (36.7%)	26 (43.3%)
Graduate	12 (40%)	11 (36.7%)	23 (38.3%)
<b>Level of Injury</b>			
Cervical	14 (50%)	13 (43.3%)	27 (46.7%)
Thoracic	8(26.7%)	11 (33.3%)	19 (30%)
Lumbosacral	7 (23.3%)	7 (23.3%)	14 (23.3%)

**Table 3.** The patient satisfaction, compliance, and feedback towards the mode of rehabilitation given to them were analyzed by using One-way ANOVA. The results obtained after one-way ANOVA are illustrated in the table below.

	TARP Group MEAN ± S.D.	Conventional group MEAN ± S.D.	F- value (df1-df2)	Significance (p-value)
Feedback 1 <sup>st</sup> week	35.793 ± 5.267	32.742 ± 4.523	5.818	0.019
Feedback 2 <sup>nd</sup> week	36.276 ± 5.945	33.774 ± 4.631 35.710 ± 4.576	3.330	0.073
Feedback 2 <sup>nd</sup> week	38.034 ± 6.167	35.710 ± 4.576	2.774	0.101
Feedback 4 <sup>th</sup> week	39.793 ± 5.544	37.806 ± 4.362	2.396	0.127
Compliance to Accuracy	8.897 ± 2.304	7.968 ± 1.516	3.444	0.069
Compliance to Frequency	5.690 ± 1.910	5.774 ± 2.060	0.027	0.870
Compliance to Duration	9.138 ± 2.601	7.419 ± 1.839	8.820	0.004
Compliance to Satisfaction	6.448 ± 1.882	6.387 ± 1.994	0.015	0.90543

Patient feedback towards the mode of rehabilitation (F1 = feedback of 1st week) shows significant difference between groups (p-value of 0.019) while it had no significant difference in other weeks. The compliance of duration of exercises at the end of 3rd week (CD3) shows significant difference between groups (p-value of 0.004).

## Discussions

The present study intended to check out the patient compliance and feedback with home exercises in two modes of patient education one is conventional and other is technology assisted in SCI survivors.

Home education programs are a vital part of long term rehabilitation process in spinal cord injury subjects. Spinal cord injury requires a rigorous rehabilitation protocol that includes in patient and home exercise regimen along with the medical treatment. In order to achieve optimum results of rehabilitation, patient are taught to indulge themselves in home education programs with regular follow ups. Home exercise regimens are usually shared with the patients in the form of written instructions, tabular form and pictorial presentation. Moreover these exercises lack patient specificity and are considered more generalized for all the patients. So the current study aimed to compare the conventional home education program with the technology assisted program in terms of compliance and feedback. In the latter technology, patients were involved in making videos of several exercises to be taught, which was further used as education program at home. This was more patient specific and tailor made.

## Compliance

Compliance has been found to be waning after a certain period of discharge in spinal cord injury subjects as they lack motivation and feedback about their progress from the professionals. The current study assessed patients' compliance in four domains namely accuracy of exercise, duration of exercise, frequency of exercise and satisfaction. It was observed that the subjects in TARP group indulge in longer duration of exercise as compared to the other group. It may be explained on the basis that TARP group had more visually appealing and easy to follow exercise regimen. Additionally, subjects also reported that they were more confident to perform exercises when they had a video going on as compared to those who were reading instructions about the exercise had more concerns if they were doing it right. To treatment is considered to be a useful measure for treatment techniques and patient education program, especially when it comes for home based exercise program. The subject's home served as the primary location for performing exercises (as instructed in the hospital).<sup>(1,2)</sup> Exercising at home gets affected by numerous factors like remembrance the performing, time duration, expenses to hire personal therapists, and due to a lack of access to reimbursed environment like at hospital.<sup>(1)</sup> In SCI the duration of rehabilitation is prolonged and depends on site on injury, type of surgery, etc. Home exercises prescribed to SCI survivors are more complex and involves multiple systems like neuro-muscular trainings, respiratory exercises.<sup>(3)</sup> Traditionally the SCI survivors get exercise instructions in pictorial, verbal or tabular format due to which exercise compliance decreases rapidly after a period of time because of non-supervision.<sup>(4,5)</sup> So, we give customized videographs of exercise (TARP) featured SCI survivors as a tool for home based exercise program and done a comparison to look out patient compliance in the two groups (TARP and Conventional). Findings of the study shows that the duration of exercise performance at home comes out to be significant in TARP group (refer to table 5.4) and it should be justified as the participants found video instructions more explanatory and comprehend and it supported by the studies<sup>(6,7)</sup> and contrasting to the study.<sup>(8)</sup>

## Feedback

Feedback is an essential component of follow up because it helps healthcare professionals to identify ways to close the gap between actual and desired performance.<sup>(9)</sup> Feedback has been found to give information about patient's perception towards a treatment or protocol. Additionally, patient can also rate quality, service, and the experience towards the service with the help of feedback forms. The current study included weekly feedback from the participants using a feedback questionnaire. It was observed that during the first week, patient found that the TARP was significantly better than the conventional group in terms of replicating the exercise, ease of following the instructions and more confidence to follow the regime.

This may be explained that the TARP included instructions that were comprehensive and easy to follow as patients didn't have to read and comprehend the written instructions. The instructions were quite elaborative and easy to understand in the video. Patients also found a sense of familiarity since all the videos were tailored made on the same patient. So, the patient reported that they were more enthusiastic, motivated, confident to replicate which in turns found to be more time saving than the conventional group (refer table 5.4) but at the end of subsequent weekly feedback both groups were same, which may be justified on the basis of regular follow up as accordance with the previous studies.<sup>(10,11)</sup>

## Dyspnea

Dyspnea defined as the subjective feeling of breathing discomfort that varies in intensity. It was found to be one of the most irritable symptom followed by SCI<sup>(12,13)</sup>.

Modified Borg scale and VAS scales were used in the current study to evaluate dyspnea. The analysis revealed that although dyspnea improved significantly in both the groups but there was no significant difference between the two groups (refer table 5.2a & 5.2b). Regular follow-up and patient interaction improved the outcomes of the home care program as both the groups were getting regular calls to follow up the exercise program. It may be one of the major reasons of improvement of outcomes. <sup>(12,13)</sup>

## Conclusion

In a nutshell, our study suggested that video assisted exercise program (TARP) in patient education was not rated better than routine method of patient education by the patients undergoing rehabilitation. However, the TARP group showed significant improvement in duration of exercise and treatment compliance and better feedback towards mode of exercises given for home care program. Regular follow up improves the adherence towards the rehabilitation and exercise based treatments.

## Conflict of Interest

The authors declare no conflict of interest.

## References

- O'Connor, R., Murray, P. Review of spinal cord injuries in Ireland. *Spinal Cord* **44**, 445–448 (2006).
- Kryger, M. A., Crytzer, T. M., Fairman, A., Quinby, E. J., Karavolis, M., Pramana, G., ... & Dicianno, B. E. (2019). The effect of the interactive mobile health and rehabilitation system on health and psychosocial outcomes in spinal cord injury: randomized controlled trial. *J Med Internet Res*, *21*(8), e14305.
- Winslow, C., & Rozovsky, J. (2003). Effect of spinal cord injury on the respiratory system. *American journal of physical medicine & rehabilitation*, *82*(10), 803-814.
- Cho, N. O., Park, S. W., Kim, K. S., Kim, S. O., Kim, I. J., Park, S. J., ... & Yoo, K. H. (2007). The effects of respiratory rehabilitation training on respiratory functions of cervical spinal cord injury patients. *The Korean journal of rehabilitation nursing*, *10*(2), 108-115.
- Nas, K., Yazmalar, L., Şah, V., Aydın, A., & Öneş, K. (2015). Rehabilitation of spinal cord injuries. *World journal of orthopedics*, *6*(1), 8.
- Ksibi, I., Lebib, S., FZ, B. S., Miri, I., Koubaa, S., & Dziri, C. (2008). The contribution of home based exercise programme in case of osteoarthritis of the knee. *La Tunisie medicale*, *86*(10), 881-889.
- Bezalel, T., Carmeli, E., & Katz-Leurer, M. (2010). The effect of a group education programme on pain and function through knowledge acquisition and home-based exercise among patients with knee osteoarthritis: a parallel randomised single-blind clinical trial. *Physiotherapy*, *96*(2), 137-143.
- Frasuńska J, Wojdasiewicz P, Tederko P, Wasiaak K, Tarnacka B. Adherence to prescriptions of therapeutic exercises in patients with traumatic spinal cord injury. *Ann Agric Env Med [Internet]*. 2021 [cited 2021 Aug 23];*28*(2):331–8. Available from: <https://www.r-project.org/>
- Study AC. Accuracy of Performing Home-Based Exercises in Musculoskeletal Disorders : Accuracy of Performing Home-Based Exercises in Musculoskeletal Disorders : A Cross-Sectional Study. 2018;(November).
- Siddall PJ, Wrigley PJ. Spinal cord injury. *Clin Pain Manag Chronic Pain*, Second Ed. 2008;*359*:388–404.
- Sluijs EM, Kok GJ, Van der Zee J, Turk DC, Riolo L. Correlates of exercise compliance in physical therapy. *Phys Ther*. 1993;*73*(11):771–86.
- Friedrich M, Gittler G, Halberstadt Y, Cermak T, Heiller I. Combined exercise and motivation program: Effect on the compliance and level of disability of patients with chronic low back pain: A randomized controlled trial. *Arch Phys Med Rehabil*. 1998 May 1;*79*(5):475–87.
- Chen HY, Wu TJ, Lin CC. Improving self-perception and self-efficacy in patients with spinal cord injury: The efficacy of DVD-based instructions. *J Clin Nurs*. 2015;*24*(11–12):1666–75.
- Syed UE, Kamal A. Video game-based and conventional therapies in patients of neurological deficits: an experimental study. *Disabil Rehabil Assist Technol [Internet]*. 2021;*16*(3):332–9. Available from: <https://doi.org/10.1080/17483107.2019.1679266>
- Lysack C, Dama M, Neufeld S, Andreassi E. Compliance and satisfaction with home exercise: A comparison of computer-assisted video instruction and routine rehabilitation practice. *J Allied Health*. 2005;*34*(2):76–82.
- Hardavella G, Aamli-Gaagnat A, Saad N, Rousalova I, Sreter KB. How to give and receive feedback effectively. *Breathe*. 2017;*13*(4):327–33.
- Jabson JM. Follow-up care instructions, treatment summaries, and cancer survivors' receipt of follow-up health care and late/long term effects. *Support Care Cancer*. 2015;*23*(7):1851–6.

18. Sartipy U. Loss to Follow-Up? *Ann Thorac Surg.* 2017;103(3):1037.
19. Gwinnutt CL, Driscoll P. Advanced trauma life support. Vol. 48, *Anaesthesia.* 1993. 441–442 p.
20. Sheel AW, Foster GE, Romer LM. Exercise and its impact on dyspnea. *Curr Opin Pharmacol* [Internet]. 2011;11(3):195–203. Available from: <http://dx.doi.org/10.1016/j.coph.2011.04.004>

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