

THE IMPACT OF ACUTE INPATIENT REHABILITATION ON SUBSEQUENT  
QUALITY OF LIFE IN CHRONIC SCI

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**ABSTRACT** There are 15,000 new cases of spinal cord injury per year in India. The majority of persons survive due to improved quality of acute care compared to the past. Survival impacts Quality of Life. In developed countries quadriplegia is associated with a poor QOL on average. South Asian QOL on average is lower than in developed countries so those with diseases are worse off. A large part of expenditure is on early surgery and subsequent home based therapy. Most are managed at centers without medical rehabilitation units. Once stabilized the patient is discharged for home based care. The net impact leads to lost follow-up or succumbing to associated life-threatening complications. It is established that multidisciplinary rehabilitation improves outcomes in this population. Interventions to improve function thereby QOL may prove cost-effective in the long run. There is no Indian data on the impact on QOL comparing acute inpatient rehabilitation to early home based care in tetraplegia. In this study we report the long-term impact of acute medical rehabilitation with follow-up on Quality of Life in Chronic SCI. We specifically report this in Chronic SCI patients greater than 1 year from injury using the EQ5DL3, and VAS.

**KEYWORDS :** Spinal Cord Injury, Quality of Life, Acute Inpatient Rehabilitation

The global incidence of Spinal Cord Injury (SCI) ranges from 8 to 246 cases per million people per year.<sup>1</sup> The incidence in India is 15,000 new cases per year.<sup>2</sup> The resulting alterations impact Quality of Life (QOL). In developed countries quadriplegia is associated with a poor QOL on average. South Asian QOL on average is lower than in developed countries so those with diseases are worse off.<sup>3</sup>

In India a large part of expenditure for this population is on early surgery and subsequent home based therapy.<sup>4</sup> Most of these patients are managed at centers without medical rehabilitation units. Once stabilized the patient is discharged for home based care. The net impact leads to lost follow-up or succumbing to associated life-threatening complications. It is established that multidisciplinary rehabilitation improves outcomes in this population.<sup>5</sup> Interventions to improve function thereby QOL may prove cost-effective in the long run. There is no Indian data on the impact on QOL comparing acute inpatient rehabilitation to early home based care in tetraplegia.

In this study we report the long-term impact of acute medical rehabilitation with follow-up on Quality of Life in Chronic SCI. We specifically report this in Chronic SCI patients greater than 1 year from injury using the EQ5DL3, and VAS.

#### METHODOLOGY

**Design:** Longitudinal study of cohort

The Electronic Medical Record was reviewed for patients admitted from 2012-2018 with tetraplegia. The baseline data was compiled and patients were called by a Medical Social Worker who performed the following scales: VAS, and EQ5D3L. EQ5D3L has the following subcomponents: Anxiety, pain, usual activities, self care, mobility. The scores were compared to those who opted to home care a vs those who received Acute Inpatient Rehabilitation (AIR). Along with this we report compliance with Clean Intermittent Catheterization (CIC), and complication rates.

**Sample size:** A power study was done which yielded a sample size of 40

**Inclusion Criteria:** American Spinal Injury Association Grades A-C, Neurological Level of Injury C4 to C8.

**Exclusion criteria:** Incomplete, nontraumatic, below age 20, older

than age 50

**Statistical Analysis:** Chi square, Linear-by-Linear Association was done for the baseline and outcome variables.

#### RESULTS

Thirty nine adults with Spinal Cord Injury resulting in tetraplegia participated in this study. Thirty six were males, and three were females. Twenty-three opted for early home care after medical stabilization with or without surgery. Sixteen participated in AIR and came for at least one follow-up visit at three to six months. More AIR patients had C4 lesions, whereas more home care patients had C5 lesions. Otherwise the groups were comparable.

**Table 1 Summarizes Their Demographic Details.**

	Age	Gender	NLI	Etiology	ASIA	Duration	Surgery
Overall	<= 42-20 >42-19	36 males 3 females	C4- 6 C5- 14 C6- 7 C7- 8 C8- 4	20 Fall 19 RTA	A- 19 B- 15 C- 5	3.2 ± 5.1 years	No- 11 Yes- 28
AIR N= 16	<= 42-6 >42-10	15 males 1 females	C4- 5 C5- 4 C6- 2 C7- 3 C8- 2	RTA- 7 Fall- 9	A- 9 B- 5 C- 2	3.25 ± 2.7 years	No- 6 Yes- 17
Home N= 23	<= 42-14 >42- 9	21 males 2 females	C4- 1 C5- 10 C6- 5 C7- 5 C8- 2	RTA- 12 Fall- 11	A- 15 B- 5 C- 3	3.26 ± 1.4 years	No- 5 Yes- 11
p-value	0.88	0.91				0.94	

With respect to the outcome variable VAS there was a significant difference ( ) favoring the AIR group. Taking the EQ5DL3 in subcomponents, mobility showed a significant difference (p value 0.5) favoring the AIR group. Self care showed no significant difference (p value 0.18). Usual activities showed no significant difference (p value 0.09 ). Pain-discomfort showed a significant difference (p value 0.00) favoring the AIR group. Anxiety-depression showed a significant difference (p value 0.00) favoring the AIR group. With regards to

complications there were more in the homecare group compared to the AIR group. With regards to the performance of CIC the AIR group showed better adherence. (see table 2)

	VAS	Mobility	Self care	Usual activities	Pain	Anxiety	Drainage	Complications
Overall	4.33 ± 1.3	1- 1 2- 8 3- 30	1-3 2-12 3-24	1-1 2-13 3-25	1-10 2-11 3-18	1-10 2-15 3-14	IDC- 24 CIC- 15	None- 18 Rec UTI- 7 Pressure sore- 9 Scrotal abscess +/- orchidectomy- 5
AIR	6.37 ± 3.1	1-1 2-5 3-10	1-2 2-6 3-8	1-1 2-7 3-8	1-10 2-6 3-0	1-6 2-0 3-16	IDC- 4 CIC- 12	None- 8 Rec UTI- 2 Pressure sore- 2 Scrotal abscess +/- orchidectomy- 1
Home	2.91 ± 3.3	1-0 2-3 3-23	1-1 2- 6 3- 26	1-0 2-6 3-17	1-0 2-5 3-18	1-0 2-9 3-14	IDC- 20 CIC- 3	None- 10 Rec UTI- 5 Pressure sore- 7 Scrotal abscess +/- orchidectomy- 4
p-value	0.04	0.05	0.18	0.09	0.00	0.00		

## DISCUSSION

The results of this study support the conclusion that persons with traumatic tetraplegia will have better gains if they participate in AIR compared to home based therapy. In this study those receiving AIR had better mobility, less anxiety, and less pain. They were more compliant with CIC compared to those who opted for early home-based care. They also suffered from fewer complications than the other group. On the other hand they were no different from the controls for self care and usual activities. Considering their lesion, this is not unexpected. Bowel, bladder, and skin issues predominate in the chronic care of such people. Unaddressed this leads to spasticity. This in turn can affect pain, anxiety, and mobility.

One of the biggest problems a person experiences after SCI is planning for the future. Lesion completeness helps prognosticate, but when the prediction is bleak patients may too readily or not accept it. The result is those who can be better off don't realize their full potential because of convenient care, or unscientific care. The primary goal of most people with quadriplegia is to walk again. Some regain therapeutic standing and walking. These gains are lost when they are not treated holistically. This is what medical rehabilitation provides.

Enhancing quality of life is goal of rehabilitation.<sup>6,7</sup> QOL has been found to be diminished following SCI.<sup>8,9,10</sup> QOL is a sense of subjective well-being. The literature concerning SCI and QOL is littered with contradictions which must be sorted though to determine what measures should be employed. Common indicators used in SCI are health status, impairment, disability, societal participation, independent living, and employment. The EQ5DL3 addresses each of these. Factors such as injury level, injury completeness, age, marital status, and socioeconomic status potentially influence QOL in SCI. Studies supporting this are limited by small sample sizes and a lack of generalizability.<sup>11</sup> Evidence about these factors is conflicting, hence their impact on QOL is too. These were included in our study, but not factored in for their influence on the outcomes. Most studies report injury completeness and NLI don't associate with QOL. Studies comparing paraplegia and tetraplegia report no differences.<sup>12</sup> However, when differences by NLI are found, a lower QOL relates to higher-level injuries.<sup>13</sup> Considering this we limited our sample to only persons with tetraplegia

It was found that QOL ratings stabilize six months after the event. The greater time since injury, the more likely the individual with SCI will report a good QOL.<sup>14</sup> What changes is the criteria against which they measured QOL.<sup>15,16</sup> Unattainable goals may be "devalued" and those things that are achievable become more highly valued in an effort to enhance QOL.<sup>17</sup> For those with SCI, family relationships, quiet leisure activity, and creative expression were more likely rated as important or very important. All the patients in this study were of similar disposition. Additionally, priority rankings were related to what the individuals with SCI had actually attained or achieved.<sup>17</sup> Logically, those employed rated work as a higher priority than the unemployed. Unattainable goals may be "devalued" and those things that are

achievable become more highly valued in an effort to enhance QOL.<sup>18</sup> None of our participants resumed employment. A number of recent studies regarding QOL in SCI emphasize that QOL is not strongly affected by physical variables.<sup>6,7,18,19</sup> Age<sup>18, 20, 21</sup>, and gender<sup>6,7,18,19,22</sup> are also weakly related to the QOL of the persons with SCI. Physical health aspects that can explain differences in QOL are pain<sup>6, 21,23, 24, 25, 26</sup> or secondary conditions such as pressure sores and dysreflexia.<sup>18,21,26</sup> This is clearly supported by our results also. The AIR group had much less pain and complications. This manifested as better scores in the respective EQ5DL3 domains.

SCI leads to urinary incontinence resulting in urinary tract infections, nephrolithiasis, and impaired renal function. This worsens spasticity leading to poor quality of life, frequent readmission and increased dependence.<sup>27</sup> The primary goal of bladder management in SCI patients is to achieve adequate bladder drainage, low-pressure urine storage and low-pressure voiding.<sup>28</sup> Clean intermittent catheterization (CIC) is established as a safe, effective and convenient treatment modality in selected SCI patients. It is the standard for managing the neuroathic bladder of SCI patients.<sup>29</sup> Despite being a standard of care, the rate of use of CIC has been reported at 36%.<sup>30</sup> Our study shows patients receiving AIR were 75% compliant with CIC compared to the homecare group which 86% were still on an Indwelling catheter. The homecare group also had more patients with recurrent UTIs, pressure sores, and scrotal abscess as a result. The outcomes of this study should be of little surprise. They have already been shown true in prior studies in developed countries. What this study adds is specifically mobility, pain, anxiety and complications are significantly reduced when AIR is part of the rehabilitation plan.

## CONCLUSION:

Persons with tetraplegia due to Spinal Cord Injury who underwent AIR have better Quality of life and suffer fewer complications compared to those who choose home-based therapy services.

## Limitations:

small sample size, a SCI specific QoL scale

## REFERENCES

- Furlan JC, Sakakibara BM, Miller WC, Krassioukov AV. Global Incidence and Prevalence of Traumatic Spinal Cord Injury. *Canadian Journal of Neurological Sciences*. 2013 Jul;40(4):456-64
- Mukherjee AK. *Spine Injury and Disability Care*. Vikas Publishing House Pvt. Ltd., New Delhi, 1999
- Singh K, Prabhakaran D. Health-related quality of life variations by sociodemographic factors and chronic conditions in three metropolitan cities of South Asia: the CARRS study. *BMJ Open*. 2017 Oct 15;7(10):e018424.
- Amin A, Tucker S. Spinal injuries admitted to a specialist hospital centre over a 5-year period: A study to evaluate delayed admission. *Spinal Cord*. 2005;43:434-7
- Tator CH, Andrews DF. Neurological recovery, mortality and length of stay after acute spinal cord injury associated with changes in management. *Paraplegia*. 1995;33:254-62
- Middleton J, Craig A. Relationship between quality of life and self-efficacy in persons with spinal cord injuries. *Arch Physical Med Rehabil*. 2007; 88(12):1643-1648
- Shin JC, Yoon SY. Depression and quality of life in patients within the first 6 months after the spinal cord injury. *Ann Rehabil Med*. 2012;36(1):119-125
- Dijkers MP. Quality of life of individuals with spinal cord injury: a review of conceptualization, measurement, and research findings. *J Rehabil Res Dev* 2005; 42: 87-110.
- Hammell KW. Exploring quality of life following high spinal cord injury: a review and critique. *Spinal Cord* 2004; 42: 491-502.
- Post M, Noreau L. Quality of life after spinal cord injury. *J Neurol Phys Ther* 2005; 29: 139-146
- Ku JH. Health-related quality of life in patients with spinal cord injury: review of the short form 36-health questionnaire survey. *Yonsei Med J* 48:360-370, 2007
- Manns P, Chad K. Determining the relation between quality of life, handicap, fitness and physical activity for persons with spinal cord injury. *Arch Phys Med Rehabil* 1999;80:1566-71.
- Kingwell SP, Noonan VK, Fisher CG, Graeb DA, Keynan O, Zhang H, et al: Relationship of neural axis level of injury to motor recovery and health-related quality of life in patients with a thoracolumbar spinal injury. *J Bone Joint Surg Am* 92:1591-1599, 2010
- Kennedy P, Rogers B. Reported quality of life of people with spinal cord injuries: a longitudinal analysis of the first 6 months post-discharge. *Spinal Cord* 2000;38:498-503.
- Heckhausen J, Schultz R. A life-span theory of control. *Psychol Rev* 1995;102:284-304
- Myers D, Diener E. The pursuit of happiness. *Sci Am* 1996; 274(5):70-2.
- Weitzenkamp D, Kennedy P. Ranking the criteria for assessing quality of life of survivors: evidence for priority shifting among long-term spinal cord injury survivors. *Br J Health Psychol* 2000;5:57-69
- Lidal IB, Veenstra M, Hjeltmes N, Biering-Sorensen F. Health-related quality of life in persons with long-standing spinal cord injury. *Spinal Cord*. 2008;46(11):710-715
- Kortte KB, Gilbert M, Gorman P, Wegener ST. Positive psychological variables in the prediction of life satisfaction after spinal cord injury. *Rehabil Psychol*. 2010;55(1):40-47
- Ploypetch T, Dajpratham P. Change in quality of life of disabled patients after intensive inpatient rehabilitation at Siriraj Hospital. *J Med Assoc Thailand*. 2011;94(10):1245-1251.
- Mortenson WB, Noreau L, Miller WC. The relationship between and predictors of quality of life after spinal cord injury at 3 and 15 months after discharge. *Spinal Cord*. 2010;48(1):73-79.
- Geyh S, Ballert C, Sinnott A, et al. Quality of life after spinal cord injury: A comparison across six countries. *Spinal Cord*. 2012;61(4):322-326.
- van Koppenhagen CF, Post MW, van der Woude LH, et al. Recovery of life satisfaction

- in persons with spinal cord injury during inpatient rehabilitation. *Am J Phys Med Rehabil.* 2009;88(11):887-895.
24. Craig A, Tran Y, Middleton J. Psychological morbidity and spinal cord injury: A systematic review. *Spinal Cord.* 2009;47(2):108-114.
  25. Lannem AM, Sorensen M, Frosli KF, Hjeltnes N. Incomplete spinal cord injury, exercise and life satisfaction. *Spinal Cord.* 2009;47(4):295-300.
  26. van Leeuwen CM, Post MW, van Asbeck FW, et al. Life satisfaction in people with spinal cord injury during the first five years after discharge
  27. Hansen RB, Biering-Sorensen F, Kristensen JK. Bladder emptying over a period of 10-45 years after a traumatic spinal cord injury. *Spinal Cord* 2004; 42: 631–637
  28. Linsenmeyer TA, Bodner DR, Creasey GH, Green BG, Groah SL, Joseph A et al. Bladder management for adults with spinal cord injury: a clinical practice guideline for health care providers. *J Spinal Cord Med* 2006; 29: 527–573
  29. Yavuzer G, Go'k H, Tuncer S, Soygur T, Arikan N, Arasil T. Compliance with bladder management in spinal cord injury patients. *Spinal Cord* 2000; 38: 762–765
  30. Dahlberg A, Perttila' I, Wuokko E, Ala-Opas M. Bladder management in persons with spinal cord lesion. *Spinal Cord* 2004; 42: 694–698