

# Comprehensive Rehabilitation for Acute Motor Axonal Neuropathy (AMAN) in a Paediatric Patient: A Case Report and Functional - Based Intervention Approach

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**Abstract:** *This case report discusses the physiotherapeutic management of a 6 - year - old male with Acute Motor Axonal Neuropathy (AMAN), a rare subtype of Guillain - Barre Syndrome, characterized by severe respiratory symptoms and ascending polyneuropathy. The patient presented with significant respiratory compromise, requiring ventilatory support and neurorehabilitation. This article describes a comprehensive rehabilitation program aimed at regaining the patient's independence and functional abilities, emphasizing functional - based interventions. The intervention included a variety of exercises and therapies targeting strength, balance, gait, and cardiorespiratory function. The case outcome showed significant improvement in mobility and overall function. This report highlights the importance of functionally - based rehabilitation approaches for GBS in paediatric patients and suggests the potential benefits of such interventions.*

**Keywords:** Acute Motor Axonal Neuropathy, Guillain - Barre Syndrome, paediatric rehabilitation, functional - based interventions, respiratory compromise

## 1. Background

Acute motor axonal neuropathy (AMAN), is a subtype of GBS characterized with decreased compound muscle action potentials (CMAP). It is an autoimmune disorder, ascending, polyneuropathy, which manifests itself as a lower motor neuron lesion, it occurs mostly after a prior infection.

AMAN is rarely reported in Western countries (3 - 5% of all reported GBS cases) and has the most severe respiratory symptoms of all GBS variant.

Typically, it begins with distal, symmetrical paraesthesia, followed by increasing limb weakening. A common symptom is pain, which is generally reported as a deep ache or cramp in the buttocks, thighs, or between the shoulders. Most patients eventually recover completely or nearly completely, with the ability to walk alone after 3 months with only minor remaining complaints by the end of the first year.

I present a case of a 6 - year - old male with significant respiratory compromise caused by AMAN who was treated with IVIG, positive pressure ventilatory support and neurorehabilitation.

## 2. Purpose

There is dearth of literature on PT management for GBS in children. The rationale of this case report is to describe a comprehensive rehabilitation program focused on the concept of functional - based interventions to assist a patient with GBS and to regain independence and safety to

complete daily and work - related activities.

## 3. Case Description

A 6 - year - old male patient presented with ascending weakness, drooling of saliva, difficulty in breathing to Emergency Department of Rainbow Children's Hospitals, Malviya Nagar, New Delhi in 25th September 2021. There is no significant past medical history, he was a student and enjoyed running and playing with his elder sister. There was no past history of travelling or infection. Dysphonia, flaccid tetraplegia and areflexia were found in neurological examination. There were motor conduction blocks in all peripheral nerves in electrophysiological studies. Child was started with IVIG. While re - examine the patient it was found that, the child was tachypneic and not maintaining saturation on room air, his Gag was also absent. The power in his limb was 1/5. Child was on ventilatory support for 28 days and gradually weaned off to BIPAP from ventilator with O2 support after some time. Physiotherapy was started after stabilization of vitals. After discharge from the hospital in 2nd November 2021, Neuro Physiotherapy sessions were started at home with the frequency of 6 days a week.

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System Review	Results			
Cardiopulmonary	<b>Intact:</b> RHR 90 beats per minutes; BP 100/80 mm of Hg; Respiratory rate 20 breath per minutes			
Musculoskeletal	<b>Impaired:</b> forward head posture, weakness in all extremities.			
Neuromuscular	<b>Impaired:</b> slow, uncoordinated decreased locomotion.	gross	movement,	poor balance,
Communication, cognition, learning style	<b>Intact:</b> Able to understand and communicate in English and Hindi very well. Cognitively sound, visual and verbal learner			

4. Evaluation

Test and measures	Initial (Nov.2nd 2021)	Discharge (Oct.31st 2022)
Active Range of motion (AROM)	All AROM were complete (except dorsiflexors 50 B/L)	All AROM were complete (including ROM of dorsiflexors 150 B/L)
Posture	Forward head, scapular protected, Right shoulder elevated, increased lumbar lordosis.	No deviation seen
Locomotion/gait	Contact guarding of 1 person required. Not able to maintain sitting balance. No independent gait.	Ambulate independently can able to run. Slightly difference in the spatial parameter of gait between left and right foot.
Manual muscle testing (MMT)	Increased weakness of distal extremities > proximal extremities.	Predominantly weakness in B/L G. Medius
Gross motor coordination	Impaired heel to shin and rapid alternating movements.	Intact with good speed and accuracy.
Single leg stance	Unable to perform	30 second bilaterally
Hughes Severity Scale	Huges score 4 (Bedridden or chair bound)	Huges score 1 (slight clinical symptoms and sign)
Overall neuropathy limitation scale (ONLS)	12/12 (maximum disability)	0/12 (No disability)
Paediatric Berg Balance Scale	16/56 (Wheelchair bound)	47/56 (Independent)
Modified Functional independence measure (FIM)	52/126 (Level 2 - Maximal assistance)	124/126 (Level 7 – Complete independence)
Dynamic Gait Index (DGI) with modification for children	0/24 (Severe fall risk)	22/24 (safe ambulator)
Borg Rate of perceived exertion (RPE)	At rest: 9/20 At activity: 19/20	At rest: 6/20 At activity: 14/20

Manual Muscle Testing (MMT)	Initial		Discharge	
	Left	Right	Left	Right
Shoulder flexor	4	4	5	5
Shoulder extensor	3	3	5	5
Shoulder abductor	3	3	5	5
shoulder IR	3	3	4	4
Shoulder ER	3	3	4	4
Elbow flexor	4	4	5	5
Elbow extensor	4	4	5	5
Forearm supinator	3	3	5	5
Forearm pronator	3	3	5	5
Wrist flexor	3	3	5	5
Wrist extensor	3	3	5	5
Hip flexor	3	3	5	5
Hip extensor	4	3	5	5
Hip abductor	4	3	3	3
Hip adductor	3	3	4	4
Hip IR	3	3	4	4
Hip ER	3	3	4	4
Knee flexor	4	4	5	5
Knee extensor	4	4	5	5
Ankle dorsiflexor	3	3	5	5
Ankle planter flexor	3	3	5	5
Trunk flexor	2		4	
Trunk extensor	2		4	

Intervention Goals	
Short term goals to be achieved in 4 - 6 weeks.	Long term goals to be achieved in 8 - 12 weeks.
<ul style="list-style-type: none"> <li>Restoration of maximal independence.</li> <li>To improve strength and range of affected joints.</li> <li>Maintenance of airways.</li> </ul>	<ul style="list-style-type: none"> <li>Good alignment of posture.</li> <li>To maintain static balance and improve dynamic balance.</li> <li>Maintain proper gait pattern with coordinated movements.</li> </ul>

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| <ul style="list-style-type: none"> <li>• Patient and family counselling and motivation to decrease fear of fall and boost up level of confidence.</li> </ul> | <ul style="list-style-type: none"> <li>• Maintain the strength of muscles and range of motion.</li> <li>• Maintenance of airways.</li> <li>• Lifestyle modifications.</li> <li>• Regular follow ups and reassessment.</li> </ul> |
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### 5. Interventions

A progressive programme using functional exercises was used. Exercise progressed from passive ROM through gravity - eliminated AROM and antigravity AROM to

resisted functional exercises. Exercises were performed for the upper extremity, lower extremity, and trunk and for 5–10 repetitions. Exercise was terminated before the patient reported fatigue. Sessions typically lasted 60 min.

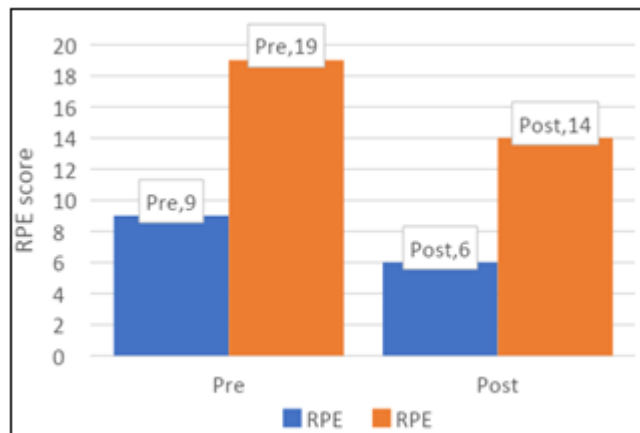
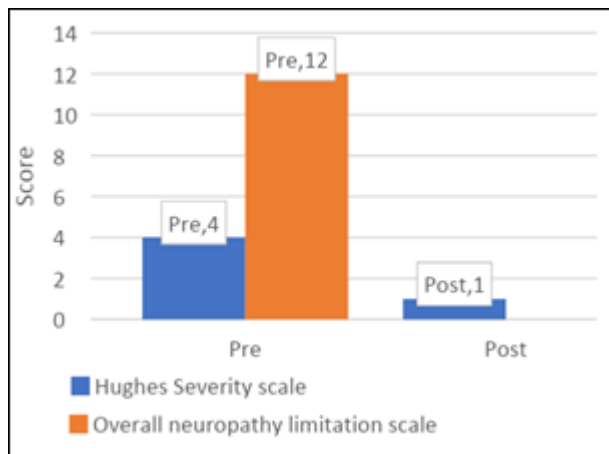
Type/ Exercise	Frequency	Intensity	Duration/ Time	Description
<b>FUNCTIONAL TRAINING</b>				
Hurdle crossing	4 Rounds of 6 hurdle/ per session 6 days a week	½ kg weight cuffs 6 hurdles	Within Half hour of time for FT	Forward and Sideways crossing of hurdles with a height of 1 foot
Stair climbing	1 sets/ session 5 times a day	½ kg weight cuffs ~100 (50+50) stairs		For promoting hip and knee flexion
Bird Dog Exercise	2 sets/ session 5 days a week	½ kg weight cuff 12 reps with 5 sec hold time	5 minutes	For the core strengthening
Pushups against the wall	2 sets/ session 5 times a week	12 reps		For strengthening of shoulder, chest, back musculature
Ball toss with therapist	2 sets/ session 5 times a week	12 reps		
Jumping jacks	2 sets / session 5 times a week	12 reps		
Step up and step down on stairs	2 sets/ session 5 times a week	12 reps		
Stepping over 19” foam pad	3 sets/ session 5 times a week	20 reps.		
Marching on plane	2 sets/ session 5 times a week		2 minutes for each set	
Jumping the hurdle of 4”	2 sets/ session 5 times a week	20 reps		
Hanging on ladder	3 sets/ session 5 times a week		For the duration of 1 minutes for each set	
Squats	3 sets / session 5 times a week	20 reps		
Walking on ladder	3 sets/ session 5 times a week			Quick step forward, backward and sideways
Kicking the ball	3 sets/ session 5 times a week	20 reps		
<b>CARDIO - RESPIRATORY TRAINING</b>				
Bicycle ergometry	5 times/ week	45% HRmax	15 minutes	
Incentive spirometry	10 inhalation / session Thrice a week	Breath holds for at least 2 or 3 seconds at a minimum at full inspiration. Expiration is performed slowly and calmly with lips		
Manual chest wall compression	1 cycle/ session Thrice a week		5 minutes	Done by pressing the bilateral lower rib cage during expiration.
<b>BALANCE TRAINING</b>				
One leg standing.	2 sets/ session 5 times a day	15 reps.	30 sec holds with eye open; 5 sec with eye closed	To Improve stability and reducing falling risk
Toe and heel raise.	2 sets/ session 5 times a day	15 reps		
Marching on plane	2 sets/ session 5 times a day	15 reps		
Mild perturbations (backward, forward, sideways) in standing position	2 sets/ session 5 times a day	15 reps		
<b>COORDINATION TRAINING</b>				
Drawing a circle	2 sets/ session 5 times a day	15 reps		
Touch therapist finger with toe.	2 sets/ session 5 times a day	15 reps		
Heel on shin.	2 sets/ session 5 times a day	15 reps		
Alternate heel to knee and heel to toe	2 sets/ session 5 times a day	15 reps		

**Home Exercise Program:**

- Deep breathing exercise.
- ROM exercise of all joint 10 reps. of all joint, thrice a day.
- Sit to stand 20 reps. Thrice a day.
- Assisted Walking.
- Bridging
- Side - lying hip abduction. Clamshells

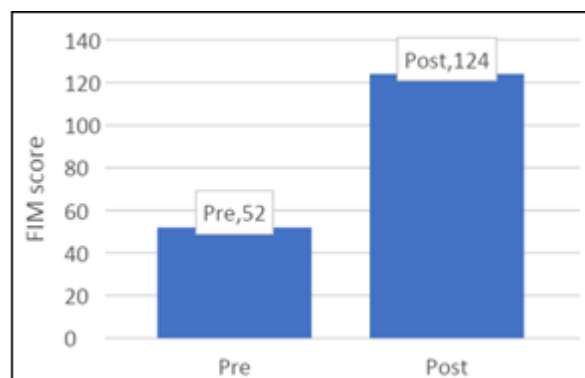
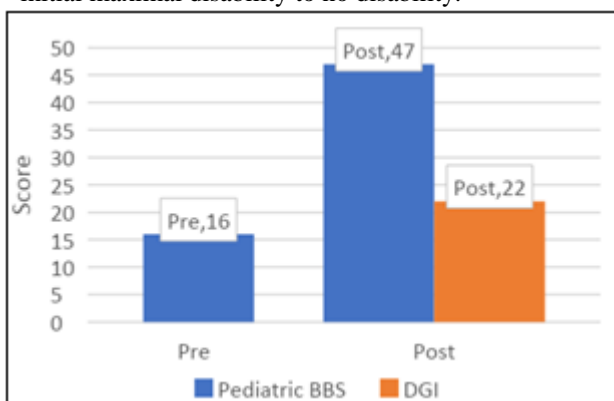
- Lower scores for both tests indicate severe fall risk.
- Paediatric BBS improved from severe fall risk to independent ambulator.
- Dynamic gait index (DGI) shows drastic improvement from severe fall risk to safe ambulator.

**Comparative Result of Pre and Post Intervention**



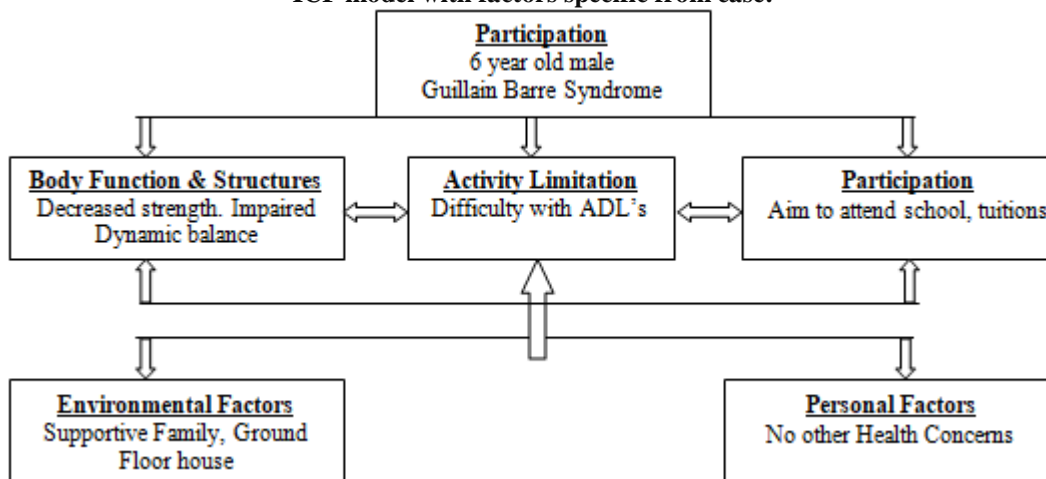
Borg rate of perceived exertion (RPE) shows drastic improvement at rest and at activity between pre and post rehabilitation.

- Higher scores for both tests indicate maximal disability.
- Hughes Severity Scale improved from moderate disability to mild disability.
- Overall neuropathy limitation scale (ONLS) depicts an initial maximal disability to no disability.



FIM score shows drastic improvement between pre and post rehabilitation.

**ICF model with factors specific from case:**



## 6. Discussion

The significance of this case report was the rare opportunity to document the outcome of a PT intervention for GBS during childhood. At the time of discharge, the patient achieved all goals and was able to return to her prior functional status with only mild postural deviation and minimal weakness. Therefore, the use of functionally - based interventions during PT management of this patient with GBS in childhood proved to be beneficial. Future work in this area could compare and contrast the outcomes of other PT interventions for GBS during childhood.

## 7. Conclusion and Clinical Implications

Exercise is a beneficial intervention. In case of GBS functionally - based interventions and supervised exercises including supervised cycling or prescribed unsupervised exercises and aerobic activities have reported improvement in strength, balance, gait and cardiorespiratory function.

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