International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Transforming Stroke Recovery: The Bobath Concept in a Case Study of Middle Cerebral Artery Infarction

Amitabh Kishor Dwivedi[1], Vaishnavi Hiren Joshi[2], Josna K J[3]

[1]Professor & Dean, Faculty of Occupational Therapy, JSS Academy of Higher Education & Research, Mysuru
[2]Assistant Professor, Faculty of Occupational Therapy, JSS Academy of Higher Education & Research, Mysuru
[3]Occupational Therapist, St. John Medical College & Hospital, Bangalore

ABSTRACT
Stroke remains a major cause of long-term disability, necessitating effective rehabilitation strategies. This case study examines the rehabilitation of a 57-year-old male patient recovering from a middle cerebral artery (MCA) infarction, utilising the Model of Bobath Clinical Practice (MBCP). The patient underwent interventions based on the Bobath concept, focusing on selective activation of trunk muscles, core engagement, and pelvic alignment to enhance postural control. Assessments revealed significant improvements in both sitting and standing postures, with reductions in compensatory fixation strategies. The targeted therapeutic exercises facilitated better trunk control and lower limb weight-bearing, resulting in overall enhanced stability. The findings underscore the importance of individualised approaches in stroke rehabilitation aligned with Bobath principles. While the outcomes are promising, further research is needed to confirm the effectiveness of the MBCP model across varied patient populations. This study highlights the potential of the Bobath Concept in improving functional recovery and quality of life for stroke survivors.

KEYWORDS: Middle Cerebral Artery (MCA) infarction, Bobath Concept, Functional Recovery

1. INTRODUCTION

Stroke is defined as an abrupt onset of neurological dysfunction resulting from abnormalities in cerebral vascular circulation, manifesting in symptoms that are specific to the affected brain regions [1]. It poses a significant global health challenge, being one of the leading causes of long-term disability. According to the World Health Organisation (WHO), approximately 13.7 million new cases of stroke are recorded annually, resulting in profound functional impairments for many survivors. Among these, strokes due to the Middle Cerebral Artery (MCA) infarction are particularly common, leading to considerable deficits in motor control, sensory perception, and cognitive function [2].

Research indicates that socioeconomic factors play a role in stroke prevalence, with higher rates observed in lower socioeconomic groups [3]. In India, the incidence of cerebrovascular disease is estimated at 13 per 100,000 people annually, highlighting the need for targeted rehabilitation strategies tailored to the specific needs of various demographics [4]. Approximately 700,000 individuals experience a stroke each

year in the country, with around 500,000 being first-time events. Such statistics underscore the urgent need for effective therapeutic interventions to address the functional deficits resulting from stroke [5, 6].

In light of these challenges, effective rehabilitation is critical for enhancing recovery and restoring functional independence. The Bobath Concept has emerged as a widely adopted approach in the management of post-stroke disabilities. This therapeutic framework, developed by Berta and Karel Bobath, emphasises the integration of posture and movement, with a focus on optimising quality of task performance through neurodevelopmental techniques [7]. While the implementation of the Bobath Concept has shown promise in clinical practice, outcomes can vary significantly among individuals, necessitating further investigation into its efficacy and practical applications in diverse patient populations [8].

Central to successful rehabilitation is the assessment of changes in motor function, sensation, coordination, and cognition. Standardised assessments—such as the Functional Independence Measure (FIM), JAMAR Hand Function Test, and Handwriting Assessment Battery for Adults (HAB)—are employed to evaluate patients 'capabilities and inform individualised treatment plans. These assessments not only identify areas of difficulty but also facilitate patient-centred goal setting, involving both the individual and their family members in the recovery process [9].

Occupational therapists play a pivotal role within multidisciplinary rehabilitation teams, utilising client-centred approaches to foster recovery through meaningful activities. By leveraging principles of brain plasticity, occupational therapy activities aim to facilitate cerebral reorganisation, promoting the development of lost skills while accommodating specific impairments [10]. The Bobath Concept aligns with this philosophy, emphasising the importance of facilitating movement and enhancing motor control through tailored therapeutic activities [11].

This study presents a detailed case analysis of a patient recovering from an MCA infarction, specifically utilising the Model of Bobath Clinical Practice (MBCP). By examining the patient's rehabilitation journey through this framework, we aim to assess the effectiveness of the Bobath concept in enhancing functional recovery in stroke rehabilitation. This case study seeks to contribute to the growing body of literature advocating for individualised, evidence-based approaches to stroke recovery.

2. CASE PRESENTATION

The case was documented in accordance with the MBCP proforma, which provides a structured framework for assessing and addressing the needs of patients recovering from stroke. This approach allows for a comprehensive understanding of the patient's condition and tailored interventions to enhance rehabilitation outcomes. The patient is a 57-year-old male, right-handed, working as an educational officer in Mysuru. He enjoys spending time with his family, including his wife and 18-year-old daughter, and values communication and interaction with colleagues. He has no history of smoking or alcohol use, and his hobbies include watching the news on TV and reading. The patient experienced a stroke on January 15, 2022, at approximately 5 a.m. while traveling from Manipal to his home. He has a history of diabetes for 10 years, for which he is currently receiving medication. The patient resides with his family and is the primary earner. He is socially active, able to walk independently, and can climb stairs with or without handrails. He commutes to his office, which is a 20-minute auto ride from his home. The patient aims (patient's goals) to achieve active sitting to enhance hand functions, enabling him to perform activities of daily living such as buttoning and writing.

Assessment of relevant functional movement task analysis included stability tasks (sitting, standing), mob-

ility tasks (sitting, locomotion), and manipulation components (sitting and dressing, activities of daily living in sitting) was done for the patient. Both environmental and manual skilled facilitation were utilised wherever required.

2.1 Sensorimotor Performance

- Sitting: The patient exhibits weakness on the right side, with a trunk slightly deviated to the left. The right shoulder is elevated, with scapular protraction. The right arm is flexed at the elbow and rests on his lap, while the right leg is abducted and externally rotated. The right foot is slightly supinated, with weight on the lateral border.
- Standing: The patient can maintain an upright posture, though the right shoulder remains elevated and slightly abducted with the elbow in flexion. A lateral pelvic tilt is observed, with the right hip elevated.
- Locomotion: The patient demonstrates a circumduction gait characterised by excessive lateral displacement of the pelvis and difficulty achieving mid-stance, which interferes with appropriate postural alignment during walking.

2.2 Postural Control

The patient is capable of performing sit-to-stand and stand-to-sit transitions without assistance, indicating a positive fundamental ability and placing him at a lower risk of falls.

2.3 Facilitation

- Manual facilitation was applied during sitting and standing to encourage a more active posture and help the patient move his centre of mass (COM) up against the gravity.
- Key verbal cues, such as “follow,” “feel,” and “grow up,” were employed to guide the patient through movements to provide verbal facilitation.
- To support stability, pillows were placed under both arms during sitting, and another person was used to stabilise the trunk during lateral pelvic tilt facilitation. Equipment such as plinths and bedside tables was also utilised to provide environmental facilitation.

2.4 Selective Movement Sequences

The patient struggled with fractionating movements in the right lower extremity and pelvic control while standing. In sitting, when posturally stable, he could selectively weight shift bilaterally. He also exhibited deficits in segmental rotation between the thorax and pelvis.

2.5 Movement Diagnosis

The patient displays lateral trunk deviation towards the left side, impacting sitting posture and functional activities involving the arms and hands, such as dressing, eating, and writing. Impaired trunk function has led to compensatory strategies that affect postural roles, characterised by increased flexion or rotation during movements. This results in asymmetric patterns, weakened muscle strength, altered muscle tension, and decreased coordination, contributing to loss of motor function.

2.6 Identification of Potential

- Motivation
- Strong family support
- Cooperative demeanour

2.7 Outcome Measures

To document changes in neurological rehabilitation, formal and reliable outcome measures were utilised, focusing on the patient's activity level and the assessment of impairments affecting function. The following tools were employed:

FIM is tool that assesses physical and cognitive disabilities, highlighting the burden of care. Table 1 displays the pre- and post-treatment scores of the FIM components for the patient recovering from a stroke. The motor sub-score increased from 86 to 87, indicating a slight improvement in physical function, while the cognitive sub-score remained stable at 35, showing no change in cognitive independence. The total FIM score improved from 121 to 122, reflecting an overall enhancement in functional independence. This table illustrates the effectiveness of rehabilitation interventions, particularly in motor function, while highlighting the need for continued focus on cognitive aspects.

Table 1: Pre- and Post-Treatment Scores of components of FIM

COMPONENT	PRE-TREATMENT	POST-TREATMENT
MOTOR SUB SCORE	86	87
COGNITIVE SUB SCORE	35	35
TOTAL FIM SCORE (MAX 126)	121	122

JAMAR Hand Function Test is a standardised measure of fine and gross motor hand functions through simulated ADLs. Table 2 presents the pre- and post-treatment standard scores of components of the JAMAR Hand function test assessed in both the dominant and non-dominant hands of the patient. For both hands, lower scores indicate improved performance, reflecting a reduced time taken to complete the activities. In the dominant hand, writing scores significantly decreased from 15.5 to 2.65, indicating substantial improvement, while simulated page turning showed a slight decrease from 19.7 to 18.38. Scores for lifting small common objects remained stable, with a minor decline from 33 to 32.21, and simulated feeding also decreased notably from 25.2 to 17.93. In contrast, stacking checkers improved slightly from 19.9 to 21.05. For the non-dominant hand, scores exhibited significant improvements across most tasks, especially in writing (from 1.2 to 0.97) and simulated feeding (from 3.7 to 2.36). Lifting small common objects decreased from 5.4 to 4.2, while simulated page turning demonstrated a marked decline from 2.6 to 0.71. Overall, the table highlights the patient's progress in regaining fine motor skills, particularly in the non-dominant hand, while showing overall improvements in task performance for both hands.

Table 2: Pre- and Post-Treatment Standard Scores for Components of the JAMAR Hand Function Test

COMPONENT	DOMINANT HAND STANDARD SCORE		NON- DOMINANT HAND STANDARD SCORE	
	PRE-TREATMENT	POST-TREATMENT	PRE-TREATMENT	POST-TREATMENT
WRITING	15.5	2.65	1.2	0.97
SIMULATED PAGE TURNING	19.7	18.38	2.6	0.71

Table 2: Pre- and Post-Treatment Standard Scores for Components of the JAMAR Hand Function Test				
LIFTING SMALL COMMON OBJECTS	33	32.21	5.4	4.2
SIMULATED FEEDING	25.2	17.93	3.7	2.36
STACKING CHECKERS	19.9	21.05	5.3	5.35
LIFTING LARGE LIGHT OBJECTS	20.9	11.7	5.5	3.91
LIFTING LIGHT HEAVY OBJECTS	15.1	13.45	7.9	5.87

HAB for Adults is a tool that identifies handwriting difficulties related to speed, legibility, and pen manipulation, suitable for adults post-stroke. Table 3 presents the pre- and post-treatment scores for various components of the HAB for Adults, assessing the patient's handwriting performance following stroke rehabilitation. The scores for the horizontal line and dots remained unchanged at 20 seconds, indicating consistent performance in these tasks. However, writing speed showed a slight improvement, increasing from 22.77 letters per minute to 24 letters per minute. The percentage of legible letters in the alphabet improved significantly from 73% to 84.6%, while the legibility of numbers also increased, rising from 75% to 83.3%. Additionally, the patient demonstrated enhanced performance in sentence composition, with the score rising from 60% to 80%. Overall, the table highlights meaningful gains in the patient's handwriting skills, particularly in legibility and composition, suggesting the effectiveness of the rehabilitation interventions implemented.

Table 3: Pre- and Post-Treatment Scores for Components of the Handwriting Assessment Battery (HAB) for Adults		
COMPONENTS	**PRE-TREATMENT SCORE**	**POST-TREATMENT SCORE**
HORIZONTAL LINE	20 seconds	20 seconds
DOTS	20 seconds	20 seconds
WRITING SPEED	22.77 letters /minute	24 letters / minute
ALPHABET (% OF LEGIBLE LETTERS)	73%	84.6%
NUMBER (% OF LEGIBLE NUMBERS)	75%	83.3%

Table 3: Pre- and Post-Treatment Scores for Components of the Handwriting Assessment Battery (HAB) for Adults		
SENTENCE COMPOSITION	60%	80%

2.8 Working Hypotheses

Day 1: Improving selective linear acceleration and core activation influences the COM and trunk alignment.

Day 2: Facilitating scapular movements and selective somatosensory feedback from the pectoralis improves upright sitting posture.

Day 3: Integration of somatosensory feedback from the foot enhances verticality and postural control, improving weight-bearing.

Day 4: Enhancing selective activation of the trunk/core and pelvis leads to better vertical alignment.

Day 5: Activating the vestibular system during extension activities improves standing and selective pelvic movement.

Day 6: Achieving the contractual hand-oriented response (CHOR) facilitates coordinated upper limb interaction with the rest of the body to maximise recovery potential.

2.9 Treatment

Table 4 summarises the day-wise application of treatment techniques based on the Bobath concept over six days for the patient. This structured intervention plan highlights the tailored application of Bobath techniques to address the patient's specific needs, facilitating improved motor performance and enhancing overall functional independence.

Day 1: The treatment commenced with a comprehensive analysis of the patient's motor performance in sitting, standing, and locomotion. Active sitting was promoted through selective linear acceleration in the lumbar and thoracic regions, aiming to achieve a more upright posture. Trunk facilitation involved slight downward compression in the mid-thoracic area, which encouraged extension and independent stabilisation once the therapist's hand was withdrawn.

Day 2: The focus shifted to facilitating scapular and pectoralis movements in various directions. This was complemented by stretching exercises for key muscle groups, with an emphasis on selectively strengthening scapular stabilisers to improve upper limb function.

Day 3: Environmental modifications were utilised to enhance the patient’s COM, facilitating the foot to correct weight-bearing patterns and initiate limb movement. This approach aimed to promote core stability during movement.

Day 4: Core and pelvic movements were facilitated to improve postural control during sitting and standing. This session concentrated on promoting weight shifting, a critical component for effective mobility.

Day 5: The focus was on selective activity in core and hip muscles during transitions between sitting and standing. This emphasised the importance of maintaining postural stability throughout functional movements.

Day 6: The treatment concluded with selective strengthening of the biceps and triceps to support shoulder stability. Additionally, upper limb movements with the left arm were explored to enhance postural control, ensuring adequate repetition of muscle activity at various speeds to promote functional recovery.

Table 4: Overview of Treatment Techniques of Bobath Concept Implemented Over Six Days

TREATMENT TECHNIQUE	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6
Environmental facilitation	✓	✓	✓	✓	✓	✓
Verbal facilitation	✓	✓	✓	✓	✓	✓
Selective linear acceleration	✓	✓	✓	✓	✓	✓
Core activation	✓	✓	✓	✓	✓	✓
Scapular setting		✓	✓	✓	✓	✓
Activation and facilitation of pectorals		✓	✓	✓	✓	✓
Foot manipulation			✓	✓	✓	✓
Activation of trunk				✓	✓	✓
Facilitation of pelvis				✓	✓	✓
Fractionate movement in pelvis					✓	✓
Facilitation of CHOR						✓
Activation & facilitation of gastrocnemius and soleus			✓	✓	✓	✓

2.10 Evaluation (Post-Treatment)

The evaluation of the patient's progress over the six days of treatment reveals significant improvements in posture, balance, and overall functional performance, reflecting the effectiveness of the Bobath concept interventions.

Day 1: The patient exhibited improved sitting posture characterised by better pelvic symmetry and consistent foot contact with the ground, enhancing stability.

Day 2: There was a notable enhancement in the COM, leading to a more upright sitting position and a reduction in scapular protraction, which contributed to a more aligned upper body.

Day 3: The patient showed improved foot contact and balanced weight-bearing on both feet, indicating progress in lower limb functionality and stability.

Figure 1. Sitting and Standing Posture of the Patient Before the Treatment

Day 4: Significant advancements were observed in trunk extension and a symmetrical standing posture, reflecting enhanced postural control and alignment.

Day 5: The patient demonstrated appropriate loading and unloading during the stance phase, coupled with improved core control, highlighting increased confidence in weight transfer during functional movements.

Day 6: Overall postural control in standing was significantly enhanced, supported by adaptive environmental changes that facilitated better motor task performance.

These evaluations underscore the patient's positive response to the targeted interventions, illustrating a comprehensive improvement in functional mobility and postural stability throughout the treatment duration.

Figure 2. Sitting and Standing Posture of the Patient After the Treatment

3. DISCUSSION

This case study highlights the effectiveness of the MBCP in the rehabilitation of a 57-year-old male stroke survivor, demonstrating the importance of tailored interventions to meet individual patient needs. The outcome measures indicate that the patient has significantly improved his postural control in both sitting and standing positions, reporting enhanced stability and a reduction in compensatory fixation strategies. This progress can be attributed to an individually designed intervention based on the Bobath concept, which emphasises the selective activation of trunk muscles, core engagement, and improved pelvic alignment to foster better trunk control, lower limb weight-bearing, and overall postural stability [4, 6].

The assessment outcomes revealed significant impairments in postural control and movement execution, particularly during functional tasks. The lateral trunk deviation and compensatory strategies exhibited by the patient underscore the necessity of addressing core stability and motor function in stroke rehabilitation. The application of the Bobath principles allowed for a comprehensive approach, focusing on functional movement analysis, skilled facilitation, and clinical reasoning. This framework helped us to address the patient's challenges related to postural control, sensory performance, and selective movement [7].

The therapeutic interventions involved exercises that promoted linear acceleration, pelvic mobilisation, and core activation. These targeted approaches effectively addressed the body imbalances, asymmetries, and decreased muscle strength that are common following a stroke, which often hinder normal movement strategies in daily activities [8, 9]. The patient's marked improvement in postural stabilisation across various contexts—sitting, standing, and locomotion—suggests that the structured interventions not only enhanced postural orientation but also improved overall functional capabilities. This progress positively impacts the patient's ability to perform Activities of Daily Living (ADLs), ultimately enhancing quality of life and promoting overall well-being and health.

Furthermore, the clinician's emphasis on recognising the patient's potential for recovery while acknowledging the limitations imposed by neurological deficits aligns with the Bobath approach's core philosophy. This perspective allows for the treatment of specific movement, perceptual, and cognitive challenges rather than merely addressing the neurological condition itself [11, 12]. The contemporary Bobath concept serves as a problem-solving approach to assessing and treating individuals with disturbances in function and movement due to central nervous system lesions [13].

The ability of the patient to adapt and learn from new challenges reflects the foundation upon which motor recovery post-injury is built, demonstrating the potential for functional improvement when engaging with tailored rehabilitation strategies. The significant gains observed in this case underscore the relevance of the Bobath concept in promoting recovery and enhancing the quality of life for stroke survivors.

Despite the promising outcomes, it is essential to acknowledge the limitations of this case study. The case study design, while rich in qualitative data, lacks the generalisability of larger randomised controlled trials. Future research should aim to explore the efficacy of the MBCP model across diverse patient populations and various stages of stroke recovery to validate these findings further.

4. CONCLUSION

This case study illustrates the effectiveness of the Model of Bobath Clinical Practice in facilitating rehabilitation for a MCA infarcts patient with significant functional impairments. The individualised intervention plan, which focused on enhancing postural control and fine motor skills, led to measurable improvements in the patient's independence and quality of life. The findings underscore the importance of a patient-centred approach that incorporates structured assessments, tailored treatments, and ongoing

support.

In conclusion, while the results are promising in this case, further investigation is warranted to validate these approaches in broader clinical settings. Continued emphasis on evidence-based practices will contribute to optimising rehabilitation strategies for stroke survivors, ultimately enhancing their recovery trajectories and functional outcomes.

5. REFERENCES

1. Mizuma, A., & Yenari, M. A. (2021). Clinical perspectives on ischemic stroke. Experimental neurology, 338, 113599. https://doi.org/10.1016/j.expneurol.2021.113599
2. World Health Organization. (n.d.). Stroke, cerebrovascular accident. World Health Organization. https://www.emro.who.int/health-topics/stroke-cerebrovascular-accident/index.html
3. World Stroke Organization. (2020). World Stroke Organisation Annual Report 2020. https://www.world-stroke.org/assets/downloads/WSO_Annual_Report_2020_online.pdf
4. Dhamija, R. K., & Dhamija, S. B. (1998). Prevalence of stroke in rural community--an overview of Indian experience. The Journal of the Association of Physicians of India, 46(4), 351–354.
5. Virani, S. S., Alonso, A., Aparicio, H. Et al. (2021). Heart disease and stroke statistics—2021 update. Circulation, 143(8). https://doi.org/10.1161/cir.0000000000000950
6. Raine S, Meadows L, Lynch-Ellerington M, editors. Bobath concept: theory and clinical practice in neurological rehabilitation. John Wiley & Sons; 2013 May 9.
7. Annethattil AM, Paul J, Sebastian J. Combined effect of bobath technique and motor relearning program (MRP) over its individual effects to improve upper limb functions in stroke patients. International Journal of Medical and Exercise Science. 2017;3(4):435-2.
8. Hebert D, Lindsay MP, McIntyre A, et al. Canadian stroke best practice recommendations: stroke rehabilitation practice guidelines, update 2015. International Journal of Stroke. 2016 Jun;11(4):459-84.
9. Graham, J. V., Eustace, C., Brock, K., Swain, E., & Irwin-Carruthers, S. (2009). The Bobath concept in contemporary clinical practice. Topics in stroke rehabilitation, 16(1), 57–68. https://doi.org/10.1310/tsr1601-57
10. Michielsen, M., Vaughan-Graham, J., Holland, A., Magri, A., & Suzuki, M. (2019). The Bobath concept - a model to illustrate clinical practice. Disability and rehabilitation, 41(17), 2080–2092. https://doi.org/10.1080/09638288.2017.1417496
11. Vaughan-Graham, J., Cott, C., & Wright, F. V. (2015). The Bobath (NDT) concept in adult neurological rehabilitation: what is the state of the knowledge? A scoping review. Part I: conceptual perspectives. Disability and rehabilitation, 37(20), 1793–1807. https://doi.org/10.3109/09638288.2014.985802
12. Handoko, T., Susilo, T. E., & Fauziah, M. R. (2021). IMPROVING POST STROKE FUNCTIONAL ABILITY USING THE BOBATH CONCEPT: A CASE REPORT. https://proceedings.ums.ac.id/index.php/apc/article/view/109