The International Classification of Functioning, Disability and Health model as a guideline for holistic practice for a patient with a vestibular disorder: A Case Report

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**Background and Purpose.** The *International Classification of Functioning, Disability and Health* (ICF) model is a disablement model that has been applied for clinical decision making to explore the relationships between health states biologically, personally, and socially. The purpose of this case report is to demonstrate the application of the ICF model to assist in clinical decision making for the development of a holistic plan of care for a patient with a vestibular disorder.

**Case Description.** The patient was diagnosed with benign paroxysmal positional vertigo. The categories of the ICF model for the patient were explored following a thorough examination. The categories of the model include health condition, body functions/structure, activity, participation, environmental and personal factors. The model was then used as a clinical decision making tool to determine multi-directional relationships between each category which was subsequently used to create a holistic plan of care.

**Intervention.** Education, canalith repositioning technique, therapeutic exercise, balance training, home exercise program were included in the intervention to address each category of the ICF model.

**Outcome.** Following six weeks of therapy, BPPV was negative, and significant improvements in quality of life measures, feelings of dizziness, anxiety, motion provoked dizziness, handicap due to dizziness, and dynamic balance were observed.

**Discussion.** The ICF model was found to be useful as a guide to clinical decision making to determine the relationships between biological, personal, and social health states. Use of the model provided a guide to determine relationships between each category of the ICF model which subsequently lead to a holistic plan of care and patient achievement of goals. Further research is called for to substantiate the use of the model for holistic practice with this health condition. Research is also called for to demonstrate the use of the ICF model to assist in clinical decision making and a holistic approach to practice for additional health conditions treated by physical therapists.
Benign paroxysmal positional vertigo (BPPV) is the most common type of vestibular disorder in the general population. Each year approximately one million adults will seek medical attention for dizziness. The incidence of BPPV increases with age and also increases the risk of falls in the elderly who are already at an increased risk for falling and morbidity. Of the population over the age of 65, one third will experience a fall each year and one in 10 falls will result in significant injury and will require medical attention. Falls in the elderly are multifactorial, however BPPV does significantly increase the risk for a fall. Other factors may include, but are not limited to, gait stability, postural stability, vision, psychological state, somatosensory, strength, and orthostatic hypotension. While treating a patient with BPPV who has experienced one or more falls, it is important to consider all factors that contribute to their current state. The International Classification of Functioning, Disability and Health (ICF) model may be of value in a patient with multiple factors influencing their current functional status and allow a therapist to understand how different aspects of a patient’s physical and psychological states as well environmental and contextual factors contribute to their problem.

The ICF is a disablement model that was first endorsed by the World Health Organization in 2001 and subsequently by the American Physical Therapy Association in 2008. The model provides a holistic approach to patient management by taking all aspects of the patient’s condition into consideration and the relationships between a patient’s health states biologically, personally, and socially. This model allows a physical therapist to understand and consider many factors that will contribute to a patient’s treatment and management of a condition. Using this disablement model, a therapist would view a patient’s current level of function to be due to a
multitude of interactions and attempt to understand each factor and its impact on the patient’s current state.8

The ICF model is subdivided into three different levels of human function and two contextual factors (Fig. 1): body functions and structure, activity, participation, environmental factors, and personal factors.5 Body functions and structure refers to a patient’s physiological and psychological state, and body structure refers to the patient anatomically.5 Activity refers to the patient’s current functional ability, and participation is a patient’s involvement in a life situation.5 Environmental factors are the physical, social and attitudinal situations a patient lives with.5 Personal factors refer to a patient’s experiences as well as genetic characteristics and psychological assets.5 The model also identifies a patient’s functioning to be a positive aspect of the component parts and disability to be a negative.5 If a therapist used this model for the treatment and management of a patient they should be able to identify the dynamic relationships between the component parts. The information obtained can consequently be used to better understand their patient and to provide treatment that addresses all relevant aspects of the patient’s condition.

The ICF model has been found to be useful in the management of patients treated by a rehabilitation team to improve multidisciplinary care and communication.8,9,10 However, a thorough review of the following databases: CINAHL, Cochrane Database of Systematic Review, PubMed, Science Direct, PEDro, and Hooked on Evidence identified no published studies describing its application to patients with vestibular dysfunction. Therefore, the purpose of this case report is to demonstrate the use of the ICF model for a patient with BPPV taking into account the three levels of human function and two contextual factors which allows for a holistic approach to physical therapy. The ICF model will be applied to assist in clinical decision
making, determining all aspects of the patient’s current level of functioning, and identifying environmental influences that contribute to the patient’s impairments and reasons for seeking physical therapy.

**Case Description**

The patient was an 83 year-old male who sought physical therapy for episodes of vertigo. He had a two year history of vertigo and was treated two years prior to this episode for BPPV with the right posterior canal being affected. At that time he had been instructed to complete the canalith repositioning technique (CRT, see Photo 1) when he experienced episodes of vertigo. He reported CRT had previously been effective to eliminate all symptoms until five days prior to initial examination. Consequently, he lost his balance while cooking causing him to fall and, as a direct result, seek additional medical attention which led to a referral to physical therapy.

Vertigo was intermittent and brought on with left side lying, turning over in bed, looking quickly side to side, forward bending, and occasionally looking up or down. He and his wife were concerned primarily because the patient was becoming progressively less independent with daily activities. He was experiencing increasingly more difficulty with transfers, bed mobility, walking, cooking at home, and he was fearful to leave home by himself or to be left alone at home. He also reported the vertigo was causing him to be increasingly more fearful of falling and feeling increasingly unsteady while walking, particularly for longer distances and on changing surfaces, which led him to use a quad cane.

The patient’s goals for physical therapy were to decrease amount of falls, eliminate the symptoms of vertigo, ambulate without a cane, be able to walk to the mail box and perform household chores.
The examination will be used to identify impairments of body functions and structure, activity limitation, participation, as well as environmental and personal factors contributing to the patient’s current status. It was hypothesized the patient’s complaints were multi-factorial and likely due to recurrent BPPV, strength and balance limitations, as well as psychological factors. The ICF model will therefore be used as a clinical decision making guide to facilitate a holistic treatment approach. Each subdivided category of the ICF will be determined for this patient and its potential impact on the patient’s current condition will be assessed. Subsequently the intervention will be focused on each established factor of the ICF model in order to obtain patient goals.

**Examination**

At the initial examination the Hallpike Dix test (Photo 2), the gold standard for diagnosing BPPV, was positive and indicated the left posterior canal was affected. The patient verbalized high anxiety during the test and a fear of falling off the treatment table, but he was able to be tested and retested during the evaluation. The patient was able to walk five minutes intermittently using a quad cane before becoming short of breath and report of fatigue. He also had difficulty transferring from a standard chair with arms requiring the use of both arm rests and three attempts to complete the task. He reported lower extremity fatigue following a total of five sit to stand transfers over the course of the examination.

Dynamic gait index (DGI) score was 15/24 indicating he was at risk for falls. The DGI is a functional test that assesses a patient’s ability to walk, walk with visual changes, walk with changes in speed, and ability to step over and maneuver around objects. It has excellent inter-rater reliability, 0.96, and excellent test-retest reliability, 0.98, for older adults. The DGI has
good inter-rater reliability for patients with vestibular dysfunctions, 0.64, and excellent intra-rater reliability, 0.95.\textsuperscript{15}

Dizziness Handicap Inventory (DHI) score was 60\% indicating he perceived himself as having a significant handicap due to his dizziness. The DHI uses a 0-100 scale with zero indicating no handicap and 100 indicating a very significant handicap. This self assessment test has a high test-retest reliability, $r = 0.97, p<.0001$.\textsuperscript{16}

The Vestibular Rehabilitation Benefit Questionnaire (VRBQ) was administered to assess perceived dizziness, anxiety, motion provoked dizziness, and quality of life.\textsuperscript{17} The patient scored a 48.64\% on the test indicating he was experiencing a 48.64\% deficit due to his vestibular dysfunction compared to his perceived normal state. He had a 60.8\% perceived deficit of quality of life due to his impairment. He was found to have a 55.6\% increase in feeling of dizziness/lose of stability due to his current problem compared to his normal state, and a 33.36\% increase in anxiety. Also, he was found to have a 26.72\% increase in perceived deficit of motion-provoked dizziness. The questionnaire has excellent test-retest reliability of the subscales mentioned; quality of life = 0.94; dizziness = 0.99; anxiety = 0.99; motion-provoked dizziness = 0.98.\textsuperscript{17}

The findings from the patient’s history and examination were then categorized using the ICF model to determine the multiple factors influencing the patient’s current condition. His current health condition (Fig. 2) is BPPV with the left posterior canal being affected. His other current complaints are falling, decrease in independence and ability to complete ADLs. The impairments of his current condition (Fig. 3) were hypothesized to be the following: Canalithiasis causing the symptoms of vertigo which causes the endolymph to continue moving after the head is no longer moving stimulating the symptom of vertigo. Decreased cardiovascular
endurance and decreased lower extremity strength was the probable cause of his limited ability to
ambulate greater than five minutes without feeling fatigued and short of breath as well as
limiting his ability to independently complete transfers. The patient's fall was likely due to his
BPPV and impaired lower extremity strength and balance. These impairments will be the focus
of the intervention for this patient. To reassess these impairments and their relationship to his
current condition the Hallpike Dix test will be completed, his ambulation distance will be
measured, he will demonstrate ability to transfer from a chair without the use of his upper
extremities, and the DGI will be assessed to test dynamic balance.

The patient’s personal factors, as well as impairments previously mentioned, were also
hypothesized to have a significant impact on his current activity level and participation (Fig. 4).
His current activity limitations included transfers, bed mobility, walking, and cooking. His
current restrictions of participation were inability to leave home or stay home alone and decrease
in independence. He reported feeling fearful of falling and the VRBQ indicated decreased quality
of life and increased perceived anxiety. These personal factors were thought to have a multi-
directional relationship to his current status (Fig. 5). His fear of falling and anxiety were
hypothesized to be causing him to avoid increasingly more physical tasks such as walking,
household chores, and traveling/going out in public. This limited activity was most likely
causing him to feel as if he had a decreased quality of life and also leading to impaired
cardiovascular endurance and lower extremity weakness. To reassess the personal factors
affecting his current condition, the DGI will be completed at the end of his physical therapy
treatment to re-determine actual risk of fall. The VRBQ will be completed to determine his
perceived quality of life and anxiety in relation to his BPPV, and the DHI will be completed to
determine his perceived level of handicap.
Environmental factors (Fig. 6) likely had a positive impact on his current condition. His wife was available to assist him as needed at home and was able to transport him to and from physical therapy. He already had modifications in his bathroom and home layout allowed space for ambulation with an assistive device; therefore, providing him with greater independence at home.

The ICF model was found to be appropriate to determine the multi-directional relationships and impact of the patient's health states biologically, personally, and socially. Figure 2-6, illustrates how the subdivided categories of the ICF model were determined. The ICF model was used to explore and assist in the clinical decision making to hypothesize the relationships between each category, as described above, and will consequently lead to the development of a holistic plan of care.

**Intervention**

The ICF model was used to assist in the creation of a holistic plan of care for the patient. Each category of the ICF model was addressed throughout physical therapy treatment. Canalithiasis, lower extremity weakness, and cardiovascular endurance were addressed from the impaired body functions/structure category (Fig. 3) to address his activity and participation limitations (Fig. 4) as well as health condition. Activity limitations included chair transfers, bed mobility, walking, and cooking which lead to decreased independence and participation in tasks. His home environment (Fig. 5) was taken into consideration over the duration of his treatment. Home environment permitted him to complete a walking program at home, and the support and assistance of his wife allowed him to attend physical therapy as she provided transportation. Personal factors (Fig. 6) implicated several areas of therapy and required modification to
treatment which will be described subsequently in the treatment of his BPPV and progress towards community ambulation.

The patient was treated eight times over the duration of six weeks. He was educated on his physical therapy diagnosis and was provided handouts on the CRT to correct the BPPV (Photo 1). The patient was already familiar with the CRT; however, his previous instructions and handouts were for the opposite ear. To address his BPPV the CRT was completed with minimal assistance during the first three treatment sessions. He was instructed to complete the CRT at home in bed in order for him to transfer independently and to ease his anxiety of completing the maneuver with limited space. His wife also observed the CRT and read through the instructions and verbalized understanding, and she was available to assist if needed.

Lower extremity weakness and de-conditioning was also discussed and he was encouraged to use his quad cane when traveling and for completion of IADLs to relieve his anxiety and avoidance of tasks. Graded lower extremity strengthening exercises were utilized to address his strength limitations, see table 1. Exercises were dosed to fatigue and increased sets were added to patient tolerance based on his form and report of fatigue. He also had a lower extremity home exercise program which included each exercise in table 1. Exercises were added to the program once the patient was able to complete each independently at physical therapy with the correct form beginning first with the non-weight bearing exercises. By the eighth physical therapy session his home program included all exercises listed in table 1. To improve upon his sit to stand transfers he was progressed from transfers to and from the mat table at 32” to a standard chair. Progression was based on his ability to complete the transfer without verbal cues and without the use of his upper extremities.
To address impaired cardiovascular endurance, the patient completed a progressive walking program as well as stationary bike. The amount of time he ambulated and biked was increased in increments based on patient report of fatigue and shortness of breath as well as respiratory rate. He was also gradually weaned from using the quad cane for ambulating short distances (15mins or less) at first, and progressed to longer distances (30mins). A progressive home walking program was prescribed as part of his home exercise program. At the eighth visit the patient and his wife verbalized they intended to purchase a stationary bike to continue improving upon his cardiovascular endurance.

Impaired balance was addressed with both static and dynamic balance exercises. He was progressed from standing with eyes open to eyes closed, head movement, followed by external perturbations as he was able to use an ankle strategy effectively and experienced no lose of balance. Changing surfaces were then utilized for balance training followed by ambulation around and over obstacles, changing speeds, and looking up/down and side to side. Progression of dynamic balance was based on his ability to effectively use an ankle strategy and demonstrate ability to maintain balance while multi-tasking (i.e. ambulation with looking side to side).

**Outcomes**

Following the CRT during the first physical therapy session, the patient reported immediate relief of vertigo symptoms. However, he experienced intermittent vertigo for two weeks following the initial appointment and was treated twice with the CRT. Over the following four weeks of physical therapy, vertigo symptoms were absent with head movements in all directions and the Hallpike Dix test was negative. On the eighth visit, six weeks after initiating
physical therapy, his VRBQ and DHI were reassessed in relation to his BPPV and his scores demonstrated significant improvement.

The final VRBQ (Graph 1) indicated a 6.84% deficit due to his vestibular dysfunction; his original score was 48.64%. He had a 0% perceived deficit of quality of life following six weeks of physical therapy compared to 60.8% upon beginning physical therapy. Feelings of dizziness/lose of stability was scored at 33.36%; his initial score was 55.6%. He scored a 16.68% of perceived anxiety; his initial score was 33.36%. At follow-up he scored a 0% on perceived deficit of motion-provoked dizziness, whereas his initial score was 26.72%. His final DHI (Graph 2) score was 2% in comparison to his prior 60%. The score indicated he perceived a 2% handicap due to his dizziness.

During the course of treatment, the patient’s activity tolerance, lower extremity strength and dynamic balance for ambulation gradually improved. Upon beginning physical therapy he was able to ambulate five minutes before becoming short of breath. After six weeks of a progressive walking program he was able to ambulate for 30 minutes. He was able to transfer sit to stand from a standard chair with equal weight bearing through each lower extremity without the assistance of his upper extremities. During the initial examination he was unable to transfer without the use of both upper extremities and required three attempts. At the sixth visit he was able to transfer from the mat table at the lowest setting without use of bilateral upper extremities, and was able to transfer from a standard chair with the use of one upper extremity. His sit to stand transfer progressed at the seventh visit and he demonstrated the ability to transfer from a standard chair without the use of his upper extremities.
Dynamic balance was also improved as demonstrated by the DGI (Graph 3) and due to no further incident of lose of balance or falls. On reassessment DGI score was 21/24 compared to a 15/24 six weeks prior. His new score indicated he was no longer in the “fall risk” category which is a score below 20.

The majority of the patient’s goals were met following six weeks of physical therapy. He did not have any subsequent falls, his symptoms of vertigo were eliminated, and he was able to return to all household chores. One of his goals was to be able to ambulate to the mailbox. This goal was not achieved due to the slippery conditions outside and the patient was recommended to avoid the task until the ice and snow melted. He was able to ambulate without his quad cane at home for up to 30 minutes, and he was able to ambulate at physical therapy without his quad cane unless he experienced fatigue at the end of the session. However, he continued to use the quad cane when ambulating out of the home. This was hypothesized to be due to continued feelings of anxiety.

Overall, the patient had significant improvement of all outcome measures. Each category of the ICF model was addressed in treatment and the patient experienced improvements in health condition, body functions/structure which subsequently improved activity and participation. Personal factors were addressed throughout the treatment and care was modified accordingly as described in the intervention. The patient’s environmental factors allowed for the patient to complete a HEP and to get transportation to physical therapy which positively influenced care. The use of the ICF model to guide clinical decision making to determine the relationships between health states biologically, personally, and socially lead to improvements in health condition, body functions/structure, and activity and participation in this case.
Discussion

The purpose of this case report was to demonstrate the application of the ICF model for a patient with BPPV to assist with clinical decision making for a holistic plan of care. The model facilitated consideration of the multi-directional relationships between body functions and structure, activity limitation, participation, environmental factors, and personal factors. This led to a holistic plan of care which incorporated each determined category of the model and influenced achievement of patient goals. Evidence based practice was also used to determine reliable and valid outcome measures and to address the patient’s BPPV with the most efficacious intervention.

In this case, the ICF model was found to be useful by this student physical therapist to guide clinical decision making for a holistic plan of care. The model was applied throughout this patient’s physical therapy care and was used to categorize impaired body structures/functions, limitations of activity and participation, and environmental and personal factors affecting him. Multi-directional relationships were subsequently explored and a holistic plan of care was developed. The individualized intervention was created based on the relationships between each ICF category.

Following six weeks of physical therapy with a holistic treatment approach developed with the assistance of the ICF model, all patient goals were met except his ability to retrieve the mail. This goal was not obtained due to environmental restrictions and therapist recommendation to not attempt this goal for safety reasons. The outcome scales utilized in this case indicated significant improvements. The VRBQ indicated improved vestibular dysfunction, quality of life, feelings of dizziness, anxiety, and motion provoked dizziness. The DHI indicated significantly
improved perceived handicap due to his dizziness. The Hallpike Dix test was negative following physical therapy treatment. His dynamic balance significantly improved following his physical therapy plan of care, and his score indicated he was no longer in the increased risk of falls category.

Based on the outcomes assessment and achievement of physical therapy goals, the ICF model was advantageous to guide clinical decision for this student physical therapist to develop a holistic approach to physical therapy. All patient impairments were addressed in the physical therapy plan of care, and interventions were based on patient goals and returning to his typical activities and previous participation in tasks. The impact of his environment and personal factors were also taken into consideration and addressed in physical therapy.

This case report described the application of the ICF model applied to guide clinical decision making for holistic practice for one patient with BPPV. This case was the first to describe the application of the ICF model for a patient with BPPV, and future research is called for to substantiate the use of the ICF model as a clinical decision making guide. Future research is also called for to demonstrate the use of the ICF model to assist in clinical decision making and a holistic approach to practice for additional health conditions treated in physical therapy. Continued research with the application of the ICF model with various patient populations and health conditions may further support the use of the model as a clinical decision making guide.
References


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Table 1. Lower extremity strengthening exercises