Advances in Medicine and Engineering Interdisciplinary Research, 2025, Volume 3, Issue 2
DOI: 10.32629/ameir.v3i2.3739
ISSN Online: 2972-3825
ISSN Print: 2972-3833

Necessity of Professional Training for the Diagnosis of Elderly with Gait Disorders

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Abstract: Aging is a group of morphological and physiologic modifications that appear as consequence of the time action on living beings, and imply changes in the organic systems that influence in movement. Taking into account the inadequacies detected in the preparation of comprehensive general medicine specialists to make the early diagnosis of elderly with gait disorders, it was necessary to systematize the theoretical referents that sustain the training of these professionals. In such a sense, changes in the systems of organs related to gait, clinical classification, causes and consequences are described in this work, which will help to solve this problem in primary health care.

Key words: professional training; elderly; gait disorders; primary health care

1. Introduction

It is estimated that by 2025, the percentage of the very elderly population in Cuba will reach 25%, making it the oldest country in Latin America and, by 2050, one of the oldest in the world. [1]

Mobility and gait disorders are common problems in the elderly and are rarely assessed in outpatient medical consultations. [2] These are defined as conditions that reduce walking speed and cause instability in gait characteristics, whether in the base of support, step length, or range of motion, or when there is a change in the synchronization of both lower extremities beyond what is expected for age, leading to ineffective walking. [2]

In this sense, the professional practice of the authors of this article, in addition to the findings reported in a study conducted in two health areas of Santiago de Cuba, [3] allow them to corroborate that there are deficiencies in the performance of general practitioners in the early diagnosis of gait disorders in the aforementioned population group; therefore, it is believed necessary to enhance the knowledge, skills, and abilities of these physicians in this direction.

Today, the world is immersed in the so-called knowledge society, marked by accelerated growth of knowledge, but also by rapid aging (knowledge obsolescence). This dynamism entails efficient knowledge management, making the preparation of human capital one of the main challenges of higher education in the 21st century. [4-6]

Professional development is the set of processes that enables university graduates to acquire and continuously improve their knowledge and basic and specialized skills. These processes have their own specialities in each region, as they are planned to address the problems identified at different levels, and all respond to the objectives set by the National Health

System to improve the quality of care for the population. [4-6]

It is therefore very useful to analyze, through professional development, the elements that allow for a better understanding of gait disorders in the elderly and to conduct an early diagnostic assessment as part of the care provided to this population at the primary health care level. This can immediately translate into improved professional performance of comprehensive general practitioners (CGPs) in the development of this activity and, consequently, improvements in the quality of life of older adults, healthcare costs, and health indicators.

To achieve these goals, it is necessary to systematize the theoretical frameworks that support professional development in these areas, which are scattered and insufficiently reflected in the literature available in Cuba. This was the objective of this research.

2. Development

2.1 Changes in systems involved in gait

Observable changes in organ systems directly involved in gait include the following: [7-9]

- Neurological: These include increased reaction time, decreased production of neurotransmitters such as dopamine, and decreased auditory, vestibular, and visual acuity, as well as the somatosensory system (especially the perception of high-frequency vibrations, touch, proprioception, and pressure stimuli). Efficient locomotion requires an integrated nervous system with sufficient motor control and adequate sensory response.
- Musculoskeletal system (locomotor system): With age, there is a general decline in muscle strength due to the loss of motor neurons and muscle fibers; changes also occur in the periarticular connective tissue, which facilitates limitation of the passive range of joint movements.
- Respiratory system: Decreased aerobic capacity with the onset of fatigue.
- Temporospatial, kinematic, and kinetic variables of gait: Older adults have a slower natural walking speed than younger adults due to a shorter stride length and increased duration of double support. Similarly, decreased moments of force are described at the hip and knee, as well as a less vigorous takeoff and greater plantigrade stance than in younger individuals. These changes are considered adaptations to achieve greater gait safety.

2.2 Clinical classification of gait disorders

Gait disorders can be classified as follows: according to movement execution (involvement of the corticospinal, basal ganglia, and cerebellum), neuromuscular weakness (involving the second motor neuron, peripheral nerve, motor end plate, and muscle), poor balance (lesions in the cerebellum, vestibular, and proprioceptive pathways), and involvement of the osteomyoarticular system (joints, muscles, and bones). [2]

2.3 Pathogenesis of gait disorders

The origin of these disorders is multifactorial. Some of the most characteristic causal problems are detailed below: [1, 2]

- Psychological: depression and stress due to falls.
- Pharmacological: benzodiazepines, neuroleptics, antidepressants.
- Musculoskeletal: differences in the length of the lower limbs.
- Cardiovascular: heart, arterial, and venous failure.
- Respiratory: chronic obstructive pulmonary disease, pulmonary fibrosis.
- Nervous: dementia, normal pressure hydrocephalus, chronic subdural hematoma, myelopathy, and parkinsonism.
- Metabolic: chronic kidney failure, chronic liver damage, diabetes mellitus, and vitamin B12 deficiency.

2.4 Consequences of gait disorders

Gait disturbances have devastating effects on older adults, including an increased risk of falls and immobility, which is a marker of future disease and preclinical neurovegetative or cerebrovascular conditions; all of which is associated with reduced survival. [7, 8]

As is well known, this disorder increases with age and brings with it progressive dependence, increased morbidity and hospital admissions, as well as partial or total immobility. Furthermore, the loss of the ability to walk and balance indicates a high health risk, which is measured in terms of functional capacity and assessed using scales, which are parameters for measuring frailty in the elderly. [7, 10, 11]

2.5 Gait assessment

Normal gait has 5 characteristics that are lost in pathological gait:

(1) Stability during stance: The body must continually alter the position of the trunk to maintain balance on the support base (stance phase) or during the stride (toe-off phase).

(2) Foot clearance during toe-off: Properly lifting the foot and moving forward requires, on the one hand, proper position and strength of the supporting ankle (static limb); on the other, sufficient flexion of the ankle, knee, and hip on the forward-moving side (dynamic limb).

(3) Preparing the foot position at the end of the swing: When the dynamic lower limb completes the toe-off phase and is about to land again, it requires balance and stability of the static limb and proper positioning of the hip, knee, and ankle of the supporting limb.

(4) Stride length: Balance, stable support, and adequate hip flexion and knee extension of the dynamic limb are required.

(5) Energy conservation: Effective gait with minimal energy expenditure requires joint stability, balance, and strength.

As seen, a thorough assessment of patients with gait disorders is key to establishing a suspected diagnosis and guiding the study. The history should include information related to the patient's progress and any overlap with other symptoms or syndromes characteristic of this population. [11, 12]

Likewise, it is important to explore functional history, such as walking ability inside and outside the home (in meters), use of assistive devices and devices for sensory deficits (glasses, hearing aids), ability to perform activities of daily living, and fear of falling. The patient will also be asked about other medical history (family, environmental, comorbidity, habits, medication use, and social and family support). [11, 12]

Furthermore, the routine physical examination will be performed in a general and segmented manner. To investigate the cause of the gait disorder, emphasis should be placed on musculoskeletal and neurological examinations, including sensory (vision and hearing), cardiorespiratory, and mental assessments. The first of these will include inspecting the posture of the trunk and extremities (scoliosis, kyphosis), muscle mass (abdominals, glutes, quadriceps, ankle dorsiflexors, gastrocnemius muscles, intrinsic muscles of the foot), bone or soft tissue deformities (knees and feet), and the alignment of the lower extremities. [11, 12]

In this regard, if any asymmetry is detected, the length of the lower extremities and the circumferences of the thighs, calves, and feet can be measured. Palpation、 should be directed toward the most common painful areas, muscle masses, and periarticular soft tissues (bursae, tendons, ligaments). The joint assessment (spine, hip, knee, ankle, and foot) should include range of motion (active and passive) and joint stability, along with special tests to identify synovitis and blockages, among other conditions. [11, 12]

The neurological examination should include cranial nerves, cerebellar tests, and motor and sensory systems; while the mental examination should focus on detecting cognitive and affective abilities. [11, 12]

Finally, balance and gait are assessed, for which subjective assessment elements and more objective tests are available. The first involves observing the way the patient gets up from the chair in the waiting room and walks to the consultation, with a view to assessing upper and lower limb movements, the polygon of support, gait symmetry, and the use of technical aids, to name a few; the second is based on the use of different tests that are vital for the development of interdisciplinary skills by family physicians, including: [11, 12]

- Progressive Romberg Test: The patient is asked to stand with their feet together for 10 seconds, with their eyes open and closed. Patients with vestibular and proprioceptive deficits lose stability when their eyes are closed.
- One-legged stance test: This is used to measure the time the patient spends on one foot.
- Tinetti test (direct observation): This allows for a more objective assessment of balance and gait to detect risk of falls. It must be performed by trained healthcare professionals (between 10 and 20 minutes). The maximum score is 28, and the cutoff point for risk of falls is 20.
- Stand-up and walk test: This is one of the simplest tests for everyday clinical practice. It correlates well with functional mobility and balance. The patient must get up from a chair without using their arms, walk 3 meters in a straight line, turn around, and return to a sitting position without using their arms. The time spent performing the activity will be recorded on two consecutive occasions. A normal time is considered to be between 12 and 14 seconds; while a time of more than 14 seconds is associated with a higher risk of falls, and is therefore considered a good predictor of falls. [11, 12]
- Gait laboratory: The patient's gait is video-recorded in the sagittal and frontal planes, with reflective markers on the joints of the lower limbs. These are triggered by 5 or 6 cameras placed around the patient and collect the following information: temporal measurements such as gait speed, cadence and step length, simple support time, and others; kinematics, or movement study, through the creation of graphs of the spatial location and movement of these in each phase of gait; kinetics, which is the study of the forces that produce movement, i.e., muscle action and external forces such as inertia, gravity, and ground reaction force, among others; dynamic electromyography, which records the activity of up to ten muscle groups simultaneously using surface electrodes. This parameter, along with kinetics, allows for an objective separation of primary from compensatory alterations.

As we have seen, the diagnosis of gait disorders is based on slowing of gait speed, instability, altered gait characteristics, and changes in the synchrony of both, above what is expected for age, all of which generate mobility difficulties and affect activities of daily living. [11, 12]

The authors of this article warn that in the course of their care practice, they have observed that general practitioners are inadequate in assessing gait and diagnosing older adults with this disorder, since they are often the first professionals to treat these individuals in the socioeconomic environment in which they live.

Elías et al. [13] define comprehensive medical care as the system of integrated and sequential actions that the physician must implement for diagnosis and early intervention, with a view to transforming the patient's health-disease status within the family and community context.

On the other hand, several authors [14, 15] define diagnosis as an orderly and systematic procedure for understanding and clearly establishing a circumstance based on observations and specific data. This always leads to an evaluation of actions related to specific objectives and allows for the identification of a problem. This process is related to the level of knowledge, the individual's performance, competence, the updating of said knowledge, and the means by which it is achieved. [14, 15]

From the perspective of medical education sciences, in recent research [16-20] focused on diagnostic assessment, the authors fully agree that studies of the elderly population within primary health care are insufficient, which prevents the identification of the learning needs of general practitioners for the comprehensive diagnostic assessment of this population group.

These needs highlight the training deficiencies of these professionals (both in undergraduate and graduate studies) in the application of the clinical-epidemiological method for early diagnosis of older adults with gait disorders, as well as a lack of understanding of the specific characteristics of the aging process in this population.

It is worth noting that interdisciplinarity was not taken into account; only reference was made to research-related specialties (nephrology, endocrinology, and pharmacology), nor was a multidimensional approach taken to assess older adults as biopsychosocial entities in the community in which they live, for whom the main health problems are the inability to perform activities of daily living.

Based on the systematization carried out, the regularities of the professional development process for general practitioners for the diagnostic assessment of older adults were identified. These are: it is a continuous, permanent, organized, planned, measurable, or evaluable process that allows for the improvement of the competencies and professional performance of general practitioners, the expression of learning needs regarding the aging process and the atypical presentation of diseases, as well as the development of updated theoretical knowledge and specific skills for care, in addition to the application of information and communications technology.

Based on the above, the authors define professional development for general practitioners for the early diagnosis of older adults with gait disorders as an organized, planned, permanent, and continuous process aimed at achieving favorable transformations through the integration of updated knowledge and skills, through scientific research and the application of the clinical-epidemiological method during care practice, in order to identify gait disorders in older adults, using an interdisciplinary approach.

3. Final Considerations

There is insufficient research related to the early diagnosis of older adults with gait disorders in primary health care and the learning needs of general practitioners on the subject; therefore, it is necessary to design a contextualized, viable, and flexible professional development approach aimed at fostering knowledge and expertise in healthcare practice.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Eloy Turro Caró: conceptualization, formal analysis, software, validation, writing of the original draft, writing-review, and editing. Participation: 50%.

Rita María Mesa Valiente: research, writing of the original draft. Participation: 15%.

Lucia Nivia Turro Mesa: methodology, visualization. Participation: 15%.

Germán Del Rio Caballero: data curation, supervision, writing-review, and editing. Participation: 20%.