

International Handbook of Occupational Therapy Interventions

Chapter 8

Wheelchair Intervention: Principles and Practice

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After my wheelchair got adapted to me and my needs, it became possible for me to cook and to go out with my friends.

—Client

Abstract The purpose of wheelchair interventions is to compensate for reduced walking ability or the lack of it, which in turn supports individual performance in activity as well as participation in society. Each occupational therapist (OT) working in this field has to have high-quality competence in different products, how to adjust and adapt them, what factors affect the fitting process, and what health risks are associated with using them. A successful solution is based on a therapeutic understanding of the user, the equipment, and the environment. Even though a wheelchair primarily is an assistive device aimed at providing mobility, it is also a chair, and thus should comfortably and ergonomically seat the user while supporting effective mobility. Regular follow-ups of the prescribed wheelchair may increase the professional's knowledge and secure good clinical practice in this field, enhancing the users' occupational performance.

Keywords Activity • Assistive technology • Fitting • Mobility • Seating

Definitions

Mobility is necessary to enable a person to carry out everyday activities and to participate in society, and it has a major impact on the quality of life. For children, mobility is a prerequisite for cognitive and social development. When mobility is difficult or impossible due to mobility limitations, wheelchair interventions might enable mobility and make activities and participation possible.

Types of Wheelchairs

Many different types of wheelchairs are available, classified by the International Standards Organization (ISO) 9999 International Standard on Assistive Products for Persons with Disability—Classification and Terminology as standards 12-22 and 12-23: human-driven wheelchairs and powered wheelchairs. These include wheelchairs propelled by both hands, a foot-driven type, attendant-controlled wheelchairs, scooters, and electric-motor-driven wheelchairs with powered steering (International Standards Organization, 2007). In addition, a number of brands and models are available. For example, the North American database Abledata (2008) contains nearly 1500 products, while in some low-income countries only a few products are available.

Background

The first known use of wheelchairs by people with disabilities was in the mid-1600s. The first wheelchairs were made of wood and hard to propel. In the 1930s, a new and relatively lightweight foldable wheelchair was manufactured. After World War II, light, easily maneuvered wheelchairs with a rigid frame were manufactured. The development of powered wheelchairs is much more recent. Even though the first powered wheelchair was invented in 1940, powered wheelchairs were not commonly in use until the 1960s (Cook and Hussey, 2002). In the last 10 years considerable interest in scooter models has emerged.

Purpose

The purpose of wheelchair interventions is to compensate for reduced walking ability or the lack thereof, so as to prevent activity limitations and participation restrictions.

Method

Candidates for the Intervention

The functional limitations requiring a wheelchair intervention may stem from a broad variety of diseases and may be temporary, intermittent, or permanent. Diagnoses are often diseases of the nervous system, the circulatory system, and the respiratory system, as well as injuries to the musculoskeletal system. These diseases and injuries may cause different mobility limitations, and it is the limitations that should be considered, rather than the specific medical diagnoses. Even though all age groups are represented among wheelchair users, most are older people. The reason is that mobility limitations increase with increasing age. More women than men use wheelchairs because of a higher prevalence of mobility limitations among women.

Epidemiology

The prevalence of wheelchair use depends on several factors. The main factor is the *availability of wheelchairs*, which varies from country to country and is depending on specific legislation on assistive technology services and on the socioeconomic circumstances that affect the willingness to provide for needy clients. However, the World Health Organization (WHO, 2007) estimates that about 1% of the world's population needs a wheelchair, equivalent to over 65 million people.

Settings

Wheelchair interventions are initiated within the medical service at hospitals or in municipal settings. Parts of the intervention, such as implementation, follow-up, and evaluation, often take place in the user's home.

The Role of the Occupational Therapist in Applying the Intervention

In a wheelchair fitting process, the role of the occupational therapist (OT) is to consider activity and participation in daily life and everything related to that. The wheelchair is going to be used in everyday occupations and has to fit the user with that perspective. It is of great importance that the fitting process be based on cooperation with the user and take account of his or her preferences.

Results

Clinical Application

This subsection describes the process of individually fitting a wheelchair for a client.

Overall Principles of the Wheelchair Fitting Process

Mobility is the primary aspect in wheelchair fittings, and the OT considers aspects related to the interface between the user and the wheelchair. The wheelchair is a replacement for other seating furniture, and therefore the user's seating comfort and support is a fundamental aspect that has to be taken into account. Risk factors related to wheelchair use have to be considered, such as pressure sores (see Chapter 7), back and shoulder pain, deformities, and discomfort.

Interview and evaluation with the client are fundamental to obtain an optimal wheelchair fitting. During this phase, the OT collects information about the client's occupational preferences as well as relevant environmental conditions. The Canadian Occupational Performance Measure (Law et al., 1998) might serve as a tool in this process. This information is related to the physical and cognitive prerequisites of the user. Physical capacity, joint range of motion, sensibility, body image, balance, and muscle tone are examples of aspects that should be considered before making a decision about the type and adjustment of a wheelchair.

Functional Capacity and Mobility

Propelling a manual wheelchair is hard work. Rolling resistance has to be overcome, especially outdoors. This is physically demanding, and a powered wheelchair might be a necessity. To minimize rolling resistance in a manual wheelchair, an adjustment of weight distribution might be effective. The wheels' angles are also relevant, since they may affect rolling resistance in a most significant negative way (Kauzlarich, 1999); that is, the rear wheels should be slightly cambered, which places the wheels close to the user. The users should have optimal opportunity to use their arms or legs for effective manual propulsion. The center of the shoulder joints should be over the hub of the rear wheels, and the fingertips should reach the hub for efficient push angle and joint movement (Boninger et al., 2003).

Different modes of controlling powered wheelchairs are available, such as joystick, steer, sip-and-puff, and switches. The selection of these available tools should be based on tests in the environments where the wheelchair is to be used.

A wheelchair of any type should fit the user in height, width, and depth. The seating posture is important since an upright seat position supports the cardiovascular and respiration function (Stein et al., 2006; Stewart, 1991).

Activity and Participation

A client to whom a wheelchair has been fitted needs further interventions to be able to perform activities of daily living (ADL) and to be able to participate in society. Here, the OT acts by enabling occupation, by making it possible to perform different activities in a seated position. This fitting process is dependent on the assessments together with wide knowledge about wheelchair adjustment and about potential advantages and risks.

Environment

The environment could be a hindrance as well as a support. The physical environment such as the home environment and the outdoor surroundings must be considered, and accessibility (see Chapter 6) may be required.

Complications of Using a Wheelchair

Many wheelchair users suffer from back and neck pain (Samuelsson, 2002). Deformities and a restricted range of motion together with pressure sores and discomfort are other complications associated with sitting for long periods. Wheelchair fitting and body posture are fundamental in counteracting these risks. A good range of motion in hips, knees, and pelvis enables the wheelchair user to attain a comfortable and optimal seating position. Wheelchair cushions, lumbar supports, and other equipment are helpful tools in this process.

Seating

The wheelchair user has the right to have a comfortable and appropriate sitting. The key to the seating posture is the pelvis. A close to neutral pelvic rotation and no lateral tilt supports the natural spine curvature and reduces the risk for high local under-seat pressure. Hip and knee angles affect pelvic rotation, and it is important to know and understand this relationship (Engström, 2002). Back and seat angles of the chair together with the wheelchair cushion and back support can be adjusted to provide optimal seating support. A strap-adjustable back support is preferable over a nonadjustable sling back support, because it makes it possible to “mold” the support to the individual user. A contoured seat cushion is often preferable since it supports pressure distribution and stability.

Training

It is of great importance that the client be trained in the use of the wheelchair until the necessary skills are acquired, such as managing curbs and other physical barriers. Training should be carried out both indoors and outdoors (Lois, 2004; Royston, 1995).

Follow-Up and Evaluation

A wheelchair fitting requires follow-up to be sure the chair appropriately fits the patient. A poorly fitting wheelchair can cause great harm. Investigation with a pressure mapping system (see Chapter 7) is one way to follow-up and evaluate the wheelchair fitting process. Other examples of follow-up outcome are user-estimated comfort, mobility aspects, and the user’s satisfaction with the wheelchair. A simple general follow-up could include the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST) 2.0 questionnaire (Demers et al., 1997). Evaluation of the effect of wheelchair interventions requires more specific assessment tools.

How the Intervention Eases Impairments, Activity Limitations, and Participation Restrictions

Wheelchairs provide people with mobility limitations with the opportunity to perform daily occupations and to participate in social life. According to the United Nations Convention on the Rights of Persons with Disabilities, article 20, personal mobility is a fundamental human right, and the convention asks for production of and access to quality mobility devices at affordable cost (WHO, 2007).

Evidence-Based Practice

Evidence outcome of wheelchair interventions is limited, especially regarding how the client uses the wheelchair and how it facilitates the performance of occupations and social participation. One reason may be that the effects of the intervention are apparent and do not require research to prove the outcome. A recent systematic review of activity and participation outcomes of mobility device interventions did not identify any studies on manual wheelchair interventions, but two pre-post studies on powered wheelchair outcome were done (Salminen et al., submitted). One study on stroke patients' powered wheelchairs showed that the users' activity problems had been substantially reduced, and that participation in the most investigated activities increased (Pettersson, 2007). Another study found that powered wheelchair interventions positively affected the users' social lives (Davies et al., 2003).

A larger body of research is available concerning evidence for mobility outcome of wheelchair interventions, even though the quality of the research and level of evidence still need to be improved. The research supports the effectiveness of wheelchair interventions (Boninger et al., 2003; Corfman et al., 2003; Hoenig et al., 2003), while attention is drawn to some of the adverse outcomes mentioned earlier in this chapter (Bottos et al., 2001; Brandt et al., 2004; Mann et al., 2004; Pettersson et al., 2006).

There is no evidence of the cost-effectiveness of wheelchairs as such, but in general, assistive technology interventions have been found to be cost-effective (Gosman-Hedström et al., 2002).

Discussion

An optimal wheelchair and seating system is a human right (WHO, 2007) for people with an impaired walking ability or the lack thereof. Occupational therapists have a clear role to play in wheelchair intervention. Their professional knowledge enables them to understand clients' daily occupational needs, abilities, and contexts. The options of wheelchairs and accessories are enormous, and the importance of knowledge in all relevant details is necessary for being able to perform an optimal fitting.

Even though it often is apparent that wheelchair interventions are effective, higher quality research is required, especially regarding occupational performance outcomes.

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