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ACTING ON THE NEED OF A CLIENT, CAREGIVER, AND PRACTITIONER SEATING AND MOBILITY GUIDE

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ACTING ON THE NEED OF A CLIENT, CAREGIVER, AND PRACTITIONER SEATING AND MOBILITY GUIDE

by

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This scholarly project, submitted by Aleksander Kohn in partial fulfillment of the requirements for the Degree of Occupational Therapy Doctorate from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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ABSTRACT

Background: There is a significant need for individuals with a disability and specific mobility limitations to require a wheeled mobility device. Wheeled mobility devices allow individuals to gain and/or maintain independence and engagement in occupations. The evaluation, prescription, and fitment of wheeled mobility devices are complex, requiring clients and caregivers to use and maintain these devices in specific ways. Barriers caregivers face can include not positioning the client properly in the wheeled mobility device, damaged or missing wheelchair parts, or improper positioning of the straps and belts, affecting posture, which could lead to secondary complications.

Purpose: This scholarly project aimed to understand the supports and barriers of wheelchair users and the direct support professionals providing care. Using this new understanding to create a reliable and effective product for improved client and caregiver experiences when working with a wheeled mobility device.

Methodology: A literature review guided by The Ecological Model of Occupation and Ecology of Human Performance Framework (EHP) identified supports and barriers to wheelchair seating and mobility. Collaboration with experts in seating and mobility devices revealed the need for additional training and educational resources to support those providing direct, daily care for wheelchair users.

Results: The training and education module Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide was developed to target barriers related to

providing care for wheelchair users using complex seating systems with the goal of increasing their comfort in achieving optimal positioning, and to trouble-shoot some common positioning errors.

Conclusion: This product was developed to train and educate the direct care providers of those using wheeled mobility devices to ensure consistency with positioning, reduce the risk of secondary complications developing due to poor positioning, and provide resources for those providing direct care. The hope is that this resource can be used across many settings and agencies for optimal outcomes on behalf of the wheelchair user.

Chapter I

Introduction

Background

When asking clients, caregivers, and others, people often mistakenly identify occupational therapists as professionals that want to help people obtain jobs. This is not wrong but is only a small component that occupational therapy can assist with. As the American Occupational Therapy Association (2020) defines, occupational therapy as the therapeutic use of day-to-day occupations with persons, groups, or populations (known as the client) to enhance or enable participation. Occupational therapy practitioners use their knowledge, education, and skill base to consider all aspects of the client which consider looking at meaningful occupations, the contexts in which these occupations take place, the performance patterns, performance skills, and the client factors impacting occupations (American Occupational Therapy Association [AOTA], 2020).

As noted by the Centers for Disease Control and Prevention (CDC, 2020), approximately 61 million adults in the United States live with a disability, or approximately 26 percent of adults in the United States (CDC, 2020). Broken down even further, there is approximately 13.7 percent of adults living with a functional disability that is impacted by mobility or have serious difficulty with walking or climbing stairs (CDC, 2020). With these statistics, it is essential to have an appropriate and accurate selection of wheelchairs and seating systems for clients to use on a day-to-day basis.

Developing evidence-based strategies and techniques, in collaboration with clients and caregivers who have challenges with proper positioning will help to prescribe, fit, modify, and adapt assistive mobility devices to suit the client's needs in their home and the community.

The findings from the literature reviewed and discussed in future sections emphasized the importance that occupational therapy must address the major impacts and limitations of individuals with limited mobility. As highlighted by Sparacio et al. (2017) in 2010, more than 3.6 million people in the United States were reliant on a wheeled mobility device to perform activities of daily living and instrumental activities of daily living. The U.S. Census Bureau (2021) now estimates that there are 20.8 million Americans that have an ambulatory difficulty and may require the use of some form of mobility device. These statistics are even more concerning when the World Health Organization (2018) has determined that 75 million people globally need a wheelchair and only 5% to 15% of those in need can obtain a wheelchair. Considering this evidence and facts, a literature review was completed with relevant data and analysis, the methods used to develop a product for a community organization, an overview of the product, and a summary of the impact and implications for the product in future practice.

Theoretical Framework

Based on the current literature and evidence presented, a theoretical framework was chosen to guide the development of the product. It was determined from the evidence and observation in the organizational facility that The Ecological Model of Occupation and Ecology of Human Performance Framework (EHP) would be the best fit. Further, several variables must be addressed and Dunn (2017) defines these as core constructs of the model, including the person, the task, the context, and performance. In regard, to the core constructs of the model and the assumptions, this helped to provide a foundation on which the product was developed and what would best allow for the product to reach the goals and sustainability it ultimately needs to achieve.

Key Terminology

Direct support professional (DSP): An individual who works directly with people who have intellectual or developmental disabilities (RCWT???).

Position: Observation is used to determine if an individual is displaying any abnormal posture (Posterior pelvic tilt, Pelvic obliquity, Pelvic rotation, Windswept posture, or Anterior pelvic tilt; Permobil, 2019).

Client: Usually classified as persons (those involved in the care of the client), groups (individuals with shared characteristics or common shared purpose), and populations (a

collective group of people with common attributes; American Occupational Therapy Association [AOTA], 2020).

Manual wheelchair (MWC): A wheelchair that relies on an individual or assistant for manual propulsion (Waugh et al., 2013).

Powered wheelchair (PWC): A wheelchair with a type of motor power derived from a primary electric power source (Waugh et al., 2013).

Durable medical equipment (DME): Equipment that has a medical purpose, is used in the home, can withstand repeated use, and is usually not useful to someone who is not sick, injured, or disabled (WSPG??).

Functional mobility: Moving from one position or place to another (during the performance of everyday activities), such as in-bed mobility, wheelchair mobility, and transfers, includes functional ambulation and transportation of objects (AOTA, 2020).

Engagement in occupation: Performance of occupations as a result of choice, motivation, and meaning within a supportive context (AOTA, 2020).

Strap: Length of webbing material used for wheelchair tiedown purposes (Waugh et al., 2013).

Belt: Length of webbing material used for part of occupant restraint or postural support device (Waugh et al., 2013).

Referral: Transition planning that may require further evaluation to a provider within occupational therapy with advanced knowledge and skill or outside the profession (AOTA, 2020).

Seating and mobility specialist: Professionals that work in seating and mobility and focus specifically on seating, positioning, and mobility (SMS???).

Chapter II

Literature Review

Occupational therapy practitioners offer a unique lens in seating and wheeled mobility evaluation and intervention. Lange (2021) asserts mobility is critical to engagement in daily occupations and requires immediate intervention when barriers to mobility exist. This is not always possible for individuals. Having a proper position for a specific task helps provide stability to optimize function during occupations. Individuals with motor, visual, cognitive, and/or sensory impairment can impact postural alignment within the wheelchair seating system, leading to postural asymmetries and decreased occupational engagement (Lange, 2021). Lange (2021) identifies that many times these barriers to maintaining a proper position and correcting this inability may be addressed through wheelchair seating. Having an appropriate wheelchair seating system enables the person to participate in activities of daily living (ADLs), work tasks, school tasks, or use of assistive technology (wheelchair or speech-generating device SGD). Lange (2021) stated that most often clientele that requires some form of wheelchair seating recommendations are pediatrics, bariatrics, and geriatrics, as well as degenerative conditions but varies based on specific client population (Lange, 2021).

These statistics are important to consider because as Xiao et al. (2019) emphasized through two different surveys, most individuals when obtaining their first powered wheelchair, most clients received an assessment with a physical therapist or

occupational therapist, but there was limited discussion of functional and social needs for these clients. Emphasizing the importance that clients and caregivers may receive some assistance and training with their new mobility device, there is a need for a resource that can be viewed both in the clinic with a trained practitioner and at home. Allowing clients and caregivers to have confidence and understand the purpose behind their mobility device, why it must be set up exactly as it was in the clinic, and how to make adaptations and modifications if needed.

Occupational therapists specializing in wheelchair and seating selection are typically members of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA). Additionally, certification can be obtained as an Assistive Technology Professional (ATP) and/or Seating and Mobility Specialist (SMS). These specific certificates and advanced knowledge help provide clients and caregivers with the knowledge and resources required to remove and replace equipment on mobility devices appropriately. Often these modifications and adaptations are not completed properly due to a lack of understanding of the purpose and the functional mechanism behind different types of equipment. Clients, their caregivers, and others must recognize and appreciate assistive mobility devices as they are part of that person's self and allow for increased independence and engagement in meaningful occupations.

Seating and Wheeled Mobility Practice Settings

Occupational therapy encompasses many areas of practice and expertise. Roberts and Evenson (2019) identified that within the realm of all practice areas, occupational therapy practitioners work in facilities that offer provision for many services to address occupational performance demands and the concerns of children and adults across the spectrum of life. Seating and mobility services are offered across many contexts of practice, including acute medical and surgical care, inpatient rehabilitation, skilled nursing and transitional care, outpatient rehabilitation, long-term care, school, private practice, assisted living, in-home health care, and community-based settings (Roberts & Evenson, 2019; Sparacio et al., 2017). Throughout this document, the word *provision* will be defined and used similarly to Cambridge Dictionary's (2023) definition in that provision is the act of providing something. This is important because occupational therapy practitioners often work with a multidisciplinary team that might include rehabilitation technology suppliers, technicians, manufacturers, and other healthcare providers and representatives from funding sources (Sparacio et al., 2017).

Secondary Complications with Seating and Wheeled Mobility

Independence for an individual is a priority and even more important when a person has a newly diagnosed diagnosis or impairment. Wheeled mobility can negatively impact a person's sense of independence. Kemmis et al. (2021) emphasize this important aspect in that it was reported that power mobility devices (PMD) enhance a participant's

ability to experience life, have an increased role involvement, and supported occupational participation. It further enabled power mobility device users the freedom to complete desirable activities such as going outside, visiting friends, or making a cup of coffee (Kemmis et al., 2021). This can have long-term impacts on the individual influencing functional and physical health. Lange (2021) identified several goals for wheelchair and seating interventions, including increasing an individual's function, preventing future complications, and providing equal pressure distribution, pressure relief, and mobility. To prevent future complications the seating system must provide optimal and aligned postural support and stability, which helps to improve functional performance and compensate for motor, sensory, visual, and cognitive impairments. Other common diagnoses and impairments that can lead to complications and impact both the seating and mobility evaluation and require subsequent follow-up therapy sessions include lordosis, asymmetrical tonic neck reflex (ATNR), scoliosis, surgeries, hemipelvectomy, sacral agenesis, fixed scoliosis, fixed kyphosis, congenital or acquired diagnoses, and impairments, athetosis/dystonia, and paralysis (Lange, 2021).

Occupational Performance

Thinking in terms of occupational therapy and the primary services provided, one of the main components that occupational therapists look at and develop are the skills and strategies that allow individuals to complete meaningful occupations. Brienza et al.

(2018) discussed that older adults are four times more likely than the general population to use a wheelchair for mobility. Seating and mobility are vital components of those occupations for individuals that have limited ambulation. Studies have found that proper seating and mobility intervention help to increase client and caregiver safety and independence. Brienza et al. (2018) looked at the nursing home setting and residents who were over the age of 60. The authors found that by providing intervention strategies that included treatment and evaluation, and individually configured wheelchair and skin protection cushions, positive outcomes for residents were increased exponentially. Some of the major outcomes that the authors noted from the study identified that these wheelchairs improved more in safe and effective use for residents who functioned safely at higher levels in their mobility devices that were individually configured using a comprehensive wheelchair and seating assessment process (Brienza et al., 2018).

Respiratory Function

With all normal day-to-day activities, people do not always consider the impacts that improper sitting posture may have on the respiratory system. This misconception has changed as more research and investigation have been done to determine the effects of sitting posture and how it impacts respiratory function. Lin et al. (2006) determined through research and studying that 70 able-bodied individuals who are seated for a prolonged time in a slumped sitting posture had decreased lung capacity, expiratory flow,

and decreased lumbar lordosis. The authors noted that their findings validate the results obtained because they demonstrated that subjects showed overall better lung function in a standing posture compared to slumped posture, normally seated posture, and against the back part of the seat without ischial support (WO-BPS). Further, the authors identified that an increase in spinal lordosis in the lumbar region induces a decrease in thoracic kyphosis and allows for the ribcage more room to expand during inspiration (Lin et al., 2006). These results further reiterate the need for proper respiratory function and allow for individuals to have the ability to breathe efficiently to engage in other occupations that include eating and swallowing which are vital to sustaining life.

Vision

The meaning and ability to see the external world and identify enjoyable and unfavorable things in the environment are what allow all to engage in meaningful occupations. Fitzsimmons (2014) referenced this when identifying that often individuals that have limited mobility and trunk control, may have limited strength in their necks, and without neutral alignment to assist, these individuals may have a limited visual field that consists of looking at the floor or the ceiling. This leads to limited new learning, social interaction, and inclusivity with these individuals (Fitzsimmons, 2014). Further, the head flexion or hyperextension of the neck will lead to decreased ability to complete functional and necessary occupations.

Communication

It can be a challenge for anyone to initiate a conversation but can be especially frustrating and challenging for an individual who is confined to a wheelchair and whose eyesight is well below a person or group of people standing and talking. As Fitzsimmons (2014) identified, the head position is part of the quality of life for people. The authors noted that having a good head position and the ability to look someone in the eyes is the first opportunity for any individual to connect with another person. As the authors reiterated, this is a typical indicator and initial reaction to how someone is feeling. Often when a head is positioned down it means that person is tuned out, not interested, or does not want to be bothered, however, as the authors described this may be posture challenges and the inability to support the head. Therefore, it is fundamental that a person that is wheelchair-bound have a good head position. Not only is a functional head position important for an individual that may rely on support in a wheelchair, but as the authors acknowledged, improving a person's head position will help to support breathing, swallowing, heart rate, communication, learning, their visual field, the comfort of the person, and the potential for decreased influences of abnormal tone and reflexes (Fitzsimmons, 2014). Other research and data analysis has found and determined similar results and conclusions. As the authors, Rosso et al. (2013) discovered through a cross-sectional analysis of 676 older adults, lower life-space mobility and disability connected

to lower levels of social engagement, and even with mobility limitations in the absence of a disability had reduced social engagement (Rosso et al., 2013). Further describing how important communication is for individuals regardless of ability and the opportunity to engage in the occupation of social engagement.

Eating and Feeding

One of the most enjoyable and necessary occupations for the individual comes from being able to eat and feed at different times throughout the day. As with vision and communication, a flexed or hyperextended neck can negatively impact both components. Flexion and hyperextension of the neck for an individual bound to a wheelchair can have similar negative consequences to eating and feeding. Fitzsimmons (2014) determined that these neck deformities can cause impacts that may impede the medical status, growth, fatigue, and function of an individual that is unable to safely consume food and gather nutrients from the food eaten. A common and increasing concern for individuals is dysphagia. Avery-Smith (1996) defined dysphagia as taking place in any stage of swallowing and having difficulty with it, which can lead to decreased functional independence. Past literature has determined that the elderly are more likely to rely on mobility devices for independence. Along these lines, the authors noted the incidence is increasing in the United States with the aging population and prevalence of dysphagia (Avery-Smith, 1996).

Other main concerns for dysphagia are complications with aspiration. Dysphagia is caused by pulmonary complications including aspiration pneumonia, airway obstruction, and death (Avery-Smith, 1996). With these complications and challenges, dysphagia can lead further to dehydration, pressure ulcers, and malnutrition leading to dependent eating and the ability to participate in rehabilitation and basic and instrumental activities of daily living. People consider eating as a pleasurable daily experience and these barriers may limit the ability of an individual to participate in social and cultural activities (Avery-Smith, 1996).

Physical and Cognitive Discomfort

When a seating and mobility evaluation is complete, the practitioners and other support staff will determine the most appropriate wheelchair seating equipment for optimal functioning if deemed necessary. Typically, with appropriate determination, there are two base forms of wheelchairs obtained for an individual (manual or powered). Powered wheelchairs are beneficial if an individual does not have the upper core strength and a full range of motion with the upper extremities to push a manual wheelchair. Though powered wheelchairs can be large, expensive, and hard to repair. Manual wheelchairs are typically more functional for individuals that have more independence and can live with little assistance from others. Manual wheelchairs may be light and easy to break down for transport, but this can lead to increased pain and complications for an

individual. Asheghan (2016) determined that there is a significant tendency to increase the severity of carpal tunnel syndrome based on the length of a past medical injury. Thus, as the authors described, more prolonged use of a manual wheelchair will result in more severe forms of carpal tunnel syndrome. This is a major concern as the authors identified that carpal tunnel syndrome is reported in about 49 to 73 percent of manual wheelchair users with spinal cord injuries (Asheghan, 2016), which is a leading indicator for increased pain in the upper extremities and may require further medical intervention and rehabilitation. Statistics would suggest that it would be important for an individual to move to a powered wheelchair. This does come with drawbacks that can impact an individual physically and mentally. Powered wheelchairs are often difficult to transfer and require an individual to rely on others and public transportation for mobility around the community. This can lead to decreased social interactions and engagement with others. Whereas a manual wheelchair is more functional for this purpose. Mortenson (2015) identified that there are some psychological drawbacks to moving from a manual wheelchair to a powered wheelchair. The authors noted that individuals may feel as though they lost a part of their body as often powered wheelchair operators become advanced at using their devices and it feels natural compared to a manual wheelchair. The authors further addressed that most individuals find it kinesthetically pleasing to propel a manual wheelchair compared to using a joystick. With being able to propel manual wheelchairs, there is a reluctance to move to powered wheelchairs as using a manual

wheelchair provides the message of an active individual within their environment (Mortenson, 2015).

Pressure Injuries

Pressure injuries in seating and mobility for individuals with limited ambulation are occupational therapists' main concern and focus. Lange (2021) identified a pressure injury or known previously as pressure sores or pressure ulcers, as a localized injury to the skin and underlying tissue over a bony prominence because of pressure, or pressure in combination with shear and friction. Pressure injuries based on severity and injury to the skin are categorized into four stages and can range from a stage 1 pressure injury (least damage to the skin) to a stage 4 pressure injury (most severe skin damage; Lange, 2021). Bhattacharya and Mishra (2015) identified that the most common and prone areas to develop pressure sores is at the bony areas like the occiput, trochanters, sacrum, malleoli, and heel. The most common pathway to ulceration is tissue ischemia, and if ischemia persists for one to two hours, necrosis takes place and pressure ulcers can form within one to two hours.

A common complication that arises from individuals who have an increased risk of pressure injury is an increased length of stay in the hospital or re-admission to the hospital after a medical event. Often re-admission results in an individual developing a pressure injury because of inability to move independently or having improper

positioning and a readjustment schedule. Typically, these increased hospital stays, and re-admission could be prevented because of a pressure injury. Gunningberg et al. (2019) determined that of the 788 pressure injuries identified in 734 patients, 91 percent of those pressure injuries could have been prevented. Other common causes of pressure ulcers are mobility problems, poor nutrition, health conditions (diabetes, heart failure, renal failure, COPD), aging skin, incontinence, and mental health conditions (Bhattacharya & Mishra, 2015).

Fukuoka et al. (2022) found that individuals with a spinal cord injury or other dysfunction had high recurrence rates for pressure injuries. In the study, the authors found that 36 months after the recurrence rate for individuals that did not have a seating and mobility evaluation had a 75 percent chance of recurrence and developing a pressure injury compared to the other group that had a seating and mobility evaluation which only had an 18 percent chance of a recurrence of a pressure injury. The authors noted that best practice strategies to prevent pressure injuries are through presurgical seating evaluations and assessment, postsurgical rehabilitation, routine follow-up, and seat adjustments for necessary changes to benefit the individual (Fukuoka et al., 2022).

Falls

Individuals that are bound to a wheelchair are considered at a higher risk of falling and sustaining an injury. As Forslund et al. (2017) found, wheelchair users with

spinal cord injuries that suffer falls are at a greater risk of fractures because of the increased prevalence of osteoporosis. From the results gathered, the authors identified that falls and recurrent falls were frequent in wheelchair users with spinal cord injuries which leads to a need for increased awareness about fall risk situations and the associated injuries from falls (Forslund et al., 2017).

Advanced Clinical Practice

When thinking of the practitioners and other healthcare professionals that assist clients with medical treatment and rehabilitation after a medical event, certified nursing assistants/aids are one of those professionals commonly associated with them. These individuals are crucial to help support the individual with their daily activities especially if that individual has limited mobility and is bound to a wheelchair. Like any other higher-level profession, certified nursing assistants do require some training and certification. Registered Nursing (2022) states that specific state regulations and requirements must be fulfilled. The organization identifies that there must be a completed state-approved certified nursing assistant program at an accredited institution. After completion of the state-approved program, there are training and clinical hours required based on the state, and once this is completed, the organization addresses a certified nursing assistant certification exam that must be taken. This state-specific certification examination consists of a written or oral portion (delivered in a group format) and a

clinical skills portion (delivered one-on-one; Registered Nursing, 2022). The national and state clinical experience and training are a requirement but do not specifically state the type of training and education provided on seating and mobility. This will typically be determined by the facility that the person is potentially going to work in and the hands-on orientation and skills that will be provided.

Within the healthcare profession, certification and advanced training can be completed. The broader education, training, and certification allow for an individual to obtain a certification as an assistive technology professional as identified by the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA). A specialty area can be taken that includes more advanced knowledge and will result in certification as a seating and mobility specialist that allows for professionals to work in seating and mobility as identified by the organization (Rehabilitation Engineering and Assistive Technology Society of North America [RESNA], 2022). To be allowed to complete the seating and mobility certification exam, the organization states that an individual must have 1,000 hours or more in seating and mobility-related services with consumers and two professional activities that include continuing education, client service delivery, advocacy, mentoring/supervision, presentations/formal instruction, publication or leadership (RESNA, 2022). Having certification and advanced knowledge in this area will allow a healthcare professional or other professional to effectively provide evaluation, intervention, and outcomes for individuals and their caregivers that require some type of mobility device for home and community mobility.

Currently, in the profession of occupational therapy, there are several types of programs that students can enroll in that will ultimately provide an individual with a degree in occupational therapy. The guidelines and regulations that are set for these individual programs are supervised through the American Council for Occupational Therapy Education (ACOTE) which then provide standards that each occupational therapy program must meet. Within the 2018 ACOTE Standards, two standards relate to assistive technology, devices, and functional mobility. ACOTE Standard B.4.11. Assistive Technologies and Devices states:

> *B.4.11. "Assess the need for and demonstrate the ability to design, fabricate, apply, fit, and train in assistive technologies and devices (e.g., electronic aids to daily living, seating and positioning systems) used to enhance occupational performance and foster participation and well-being"* (ACOTE, 2018, p. 30).

ACOTE Standard B.4.13. Functional Mobility identifies:

> *B.4.13. "Provide recommendations and training in techniques to enhance functional mobility, including physical transfers, wheelchair management, and mobility devices"* (ACOTE, 2018, p. 31).

These ACOTE Standards are specifically tied to an individual obtaining a doctorate in occupational therapy and may differ between specific programs. ACOTE Standards may vary between other educational levels within the profession of occupational therapy. The above standards are important for occupational therapy students to get an introduction in

the specialty area of assistive technology and devices, and functional mobility but do not provide the necessary training and education to specialize in this aspect and provide evidence-based and client-centered care when working with clients and caregivers. Further training and collaboration are needed with an interdisciplinary team to achieve competence and successful outcomes for clients and caregivers in this practice area.

Direct Care Education and Training

One of the greatest challenges that can be faced by an individual who has limited mobility and requires some form of seating and mobility device is through the provision of these devices and the education and training that is required. McSweeney and Gowran (2019) estimated that about 70 million people in the world require a wheelchair and many of those living in low to lower-middle-income countries where appropriate provision can be difficult. Often this can be the result of wheelchair provision being a complex process that requires expertise and an expansive knowledge base as noted by the authors. A similar concept can be observed in other communities, small to large-scale communities, where services might not be as broad and there is limited training and ability to equip individuals with the necessary resources. The insufficient education and training of personnel lead to the ineffective provision of seating and mobility devices further resulting in negative consequences for the recipient's physical health, safety, quality of life, and vocational and economic status. From the literature reviewed the authors

mentioned that a large amount of the literature maintains that team approaches are required to encompass the skills and expertise that can be achieved from a range of professionals and non-professionals to allow for more appropriate systems and increase access to wheelchair technology (McSweeney & Gowran, 2019).

Peer-led Training

A challenge often faced by an educator or anyone teaching a new skill is how best to provide the information in a manner that will allow for retention and the ability to be used in practice. Often the training and education that goes into teaching others can be time-consuming and tedious. Giesbrecht et al., (2021) described this in an article based on an eHealth manual wheelchair training program. The authors note that roughly 200,000 community-dwelling Canadians use a manual wheelchair, and it has continued to grow and rise by thirty percent or more in the last 10 years. Of this, there have been several research studies based on the Wheelchair Skills Program (WSP) and this program has reported statistically significant and clinically meaningful improvement in skill capacity during a client's inpatient rehabilitation stay and in the community. The authors further described that the training which a physical or occupational therapist typically delivers, requires four to eight sessions, with at least 10-12 hours of training recommended to ensure safe and proficient performance. With these training recommendations, when a client is in the hospital, and when most manual wheelchairs

are prescribed, there are often competing discharge demands which are prioritized over manual wheelchair training. Further results from a survey identified that 68 Canadian rehabilitation centers had reported that over half of the therapists spent two hours or less on manual wheelchair training and 18 percent provided no manual wheelchair skills training (Giesbrecht et al., 2021).

Through the article, it can be identified how much time and effort goes into the training and education for clients and caregivers when it comes to manual wheelchair skills training. This does not even factor into the other skills that are required for other wheelchair seating and mobility systems. Giesbrecht et al., (2021) determined that an appropriate and effective strategy to use with training and education on manual wheelchairs is through a peer-led wheelchair skills training program. The authors noted that there were statistically significant improvements in wheelchair skills capacity, performance, and self-efficacy through the results of the randomized control trial. The authors found the most prominent facilitators of self-efficacy were vicarious experience (observation of other peers having success) and verbal persuasion (encouragement and confidence of others) which are further expanded on in Bandura's Social Cognitive Theory (Bandura, 1997). A peer-led training approach helped to provide social interaction and aid in pairing new manual wheelchair users with trainers whom they were more likely to identify, and even enhanced self-efficacy among the peers. The authors conclude that the experience of being a peer mentor can be rewarding, as peer mentors

reported feeling valued for their skills and ability to create hope and share lived experiences with others (Giesbrecht et al., 2021).

Best Practice for Seating and Wheeled Mobility

A guiding organization that is fundamental to the profession of occupational therapy is the American Occupational Therapy Association. Within this organization, there is a set of standards and guidelines that are to be lived up to fully by all practitioners. These standards are set specifically by the Mission Statement and Vision Statement set by AOTA. Identified and stated by AOTA (2022) the mission of AOTA is "To advance occupational therapy practice, education, and research through standard setting and advocacy on behalf of its members, the profession, and the public." In this mission, there is a set of standards and guidelines are set for seating and mobility that leads to evidence-based practice that is client-centered.

Through a research article that looked at recurrence rates for pressure injuries, best practice strategies could be utilized to limit the recurrence rate of pressure injuries to individuals who are limited in mobility. These strategies identified by Fukuoka et al. (2022) included but were not limited to, presurgical seating evaluations and assessments by experts or postsurgical rehabilitation, routine follow-ups for clients and caregivers, and continued seat adjustments according to changes in the individual.

Best practices will be followed and implemented throughout the evaluation, intervention, and outcomes for clients and their caregivers. The process starts at the very beginning with the selection of the team. As the Ontario Society of Occupational Therapists (2022) stated, the client must have a choice of therapist and vendor representative. With this, the organization identified that it is important to find the correct therapist and authorizer, and vendor, and include any caregivers, friends, and/or family that may want to be involved. The organization discussed that there can be an assessment with the therapist that can assess client needs and facilitation the process with the entire team through interview and review of health history, concerns, environmental considerations, daily activities, physical assessment of the client in the wheelchair, measurements, and discussion of client goals. The organization points out there can then be appropriate equipment selection and prescription to determine appropriate size and options, features, and initial set up and trial with a discussion about funding sources that can be used to assist with purchasing of new mobility device. Once there is approved funding and selection of equipment the equipment will be ordered through the selected vendor as discussed by the organization. Once the new equipment is delivered, the organization stated that there can be fitting of the equipment based on client-specific measurements and needs, final design and fabrication of custom components, electronic programming, and client and caregiver training with follow-up sessions to determine the usability of the mobility device and if there needs to be any changes or modifications

made by the therapist and through the vendor (Ontario Society of Occupational Therapists, 2022).

Conceptual Framework

Adult Learning Theory

Learning comes in many forms and may be tackled differently depending on the individual's personality and best learning strategies. This concept applies when adults teach others about specific knowledge being shared. Being effective in teaching children, adults, and the elderly requires specific expertise in understanding pedagogy, andragogy, and gerogogy. Addressed by Merriam et al. (2007), the concept of andragogy which was introduced by Knowles in 1968 expresses that andragogy focuses on the adult learner and their life situation. The authors further described that andragogy is expressed as the art and science of helping adults learn, whereas, pedagogy, is the art and science of helping children learn. Within andragogy, there is a set of assumptions that must be considered. The authors noted these assumptions include 1.) With maturity, self-concept moves from a dependent personality towards a self-directing human being, 2.) Adults accumulate a growing reservoir of experiences, which helps with learning, 3.) The readiness of adults to learn is related to developmental tasks of the social role, 4.) Adults are more problem-centered than subject centered in learning, 5.) Most potent motivations are internal rather

than external, and 6.) Adults need to know why they need to learn something (Merriam et al., 2007).

With adult learning, there must be a consideration and identification of strategies and techniques that can be used to teach children. As identified by The SAGE Encyclopedia of Children and Childhood Studies (2020), pedagogy is the science of educating and teaching as well as an educational activity. The organization noted that the first part considers activities to equip society with knowledge and general vocational skills and competence. The second part of the definition as defined by the organization is the conscious and organized influence on an individual for achieving nurture or educational results (Pedagogy, 2020).

There must be consideration for teaching and learning about the elderly. This is identified by others as gerogogy. Pearson (2011) defined gerogogy as the transferring of information that has been designed, modified, and adapted specifically to the physiologic and psychological changes of the elderly. As noted by the author, with the maturity of the body, further changes take place and new adjustments must be utilized to accommodate these variations. The authors identified that often-occurring changes that take place with the elderly are decreases in sensory processing, short-term memory, attention span, and memory sequencing impacting learning ability. With learning, skills are required that allow for change from a fluid thinking approach to a more crystal learned through cultural meaning (Pearson, 2011).

Occupation-based Model

A fundamental component that guides occupational therapy practitioners in evidence-based care and client-centered approaches is the occupational therapy model. The guiding model that was utilized for this scholarly project was The Ecological Model of Occupation and Ecology of Human Performance Framework (EHP). The author Dunn (2017) identified that the core constructs of the model are the person, the task, the context, and performance.

The author described that the first core construct, the person component, is a set of unique variables, that include past experiences, personal values and interests, and sensorimotor, cognitive, and psychosocial skills (i.e., personal factors). In terms of the task, the author noted that tasks are objective collections of behaviors allowing for an individual to attain a target. As described by the author, context is a group of interrelated conditions that encompass a person daily. The author identified that context can then be broken down into several areas including temporal, physical, social, and cultural contexts. All of which have an impact that both supports and inhibits an individual's performance. The last core construct of the model is performance and the author defined performance as when the person engages in tasks within a context and allows others to identify that individual's performance range which is the number and types of tasks

available to the person based on interactions between personal factors (skills, abilities, and motivations) and context variables (supports and barriers; Dunn, 2017).

Considering the core constructs of The Ecological Model of Occupation there are a set of assumptions that underly the model that occupational therapy practitioners must consider. Dunn (2017) stated the first assumption is that persons and their associated contexts are unique and dynamic. This is an important aspect to consider when thinking about seating and mobility as cushions, supports, wheelchairs, and other mobility devices are unique and individualized to each person. The next assumption that the author identified is that contrived contexts differ from the natural contexts for an individual. This assumption is relevant to seating and mobility as many times seating and mobility evaluations are based in clinics. This is beneficial as there are resources available to occupational therapy practitioners. There must be thorough consideration of the functionality of the prescribed seating and mobility system and how functionally it will benefit the individual at home and in the community. Another assumption the author described is that occupational therapy involves promoting self-determination and inclusion of persons with disability in all aspects of society. This is relevant to seating and mobility as it is fundamental that in seating and mobility evaluation and intervention, the client and their caregivers have available options and the ability to select based on what is determined to be most fundamental to functionality and the ability to increase independence both at home and in the community. The last assumption that the author stated underlying the model is that independence means meeting the client's wants and

needs. This assumption was noted as an important consideration for future evaluation and interventions with clients and caregivers. Xiao et al. (2019) identified through experiences with assessments and procurements of powered wheelchairs one of the most relevant outcomes that these individuals would like to see a change in is that most clients want further discussion during this process of functional and social needs. Even if it is not covered by insurance, the ability to see features would allow for increased ability to make informed, empowered decisions. Further emphasizing the importance that clients and caregivers have independence in determining their wants and need with decision-making and support from occupational therapy practitioners.

Summary

In conclusion, in all of the literature reviewed and analyzed regarding seating and wheeled mobility, it was determined that there is a need for a program and educational resource guide that would allow for addressing these relevant issues. Through the guidance of the literature gathered and the occupation-based model, a program was hypothesized that would allow for increased education for supporting caregivers and other direct support professionals when interacting with wheelchair users. To ensure consistent application and use of wheelchair seating supports.

Chapter III

Methods

This author has an interest in seating and wheeled mobility after exposure to this topic in Graduate School, Level I, and II Fieldwork, and prior work experience. Through these experiences, the author wanted to understand the complexities of seating and wheeled mobility, and the best ways to support those providing direct care to those individuals. To begin this project, a literature review was conducted to determine the supports and barriers for wheelchair users, as well as those providing care for wheelchair users. The evidence indicated several barriers to successful quality of life for wheelchair users. These barriers include limited discussion of functional and social needs, decreased client and caregiver confidence and understanding of the purpose behind a mobility device, the reasoning behind the need for exact setup as was completed in the clinic, how to make appropriate adaptations and modifications, decreased opportunity for new learning through social interactions and inclusivity, power wheelchairs are difficult to transfer and require the individual to rely on others and public transportation for mobility and community involvement and result in decreased social interactions and engagement with others, and an increased risk of pressure injuries which leads to increased length of stay in the hospital or re-admission to hospital after a medical event.

The evidence from the literature review addressed other barriers to education and training in that there is insufficient education and training of personnel which leads to the

ineffective provision of seating and mobility devices resulting in negative consequences for the recipient's physical health, safety, quality of life, vocational and economic status, and there is often extensive training recommended when clients are in the hospital and receive manual wheelchair prescriptions but often there are competing discharge demands which are prioritized over manual wheelchair training.

Literature was also used to understand the needs of the caregiver and best practices for training those working with individuals reliant on their seating and wheeled mobility devices for successful occupational engagement. Consistency with seating and wheeled mobility devices, especially for clients who have multiple caregivers is challenging and can be a barrier. The components within this chapter include the theory chosen to guide the project, the literature review process to identify supports and barriers for wheelchair users and care providers, and the steps completed for the final program development.

The driving model utilized for this scholarly project was The Ecological Model of Occupation and Ecology of Human Performance Framework (EHP). The EHP asserts the importance of emphasis on the person, the task, the context, and overall performance. For this project, the person is the client, the caregiver, and the direct support professionals, the task is positioning and functioning of the client in a wheeled mobility device and the ability to effectively and efficiently complete meaningful occupations, and the context is the mobility device and the home and community environments that provide support or

lack thereof for the client when using a wheeled mobility device. Each of these components, when well-balanced, allows for improved occupational performance.

The author conducted a literature review to identify supports and barriers. The terms “Pressure injuries OR pressure wound OR pressure ulcer OR a-postural asymmetries OR consistency OR protocol OR procedure AND seating AND wheelchair” and “Pressure injuries OR pressure wound OR pressure ulcer OR a-postural asymmetries OR consistency OR protocol OR procedure AND seating OR wheelchair” was searched using the following databases “Cumulative Index to Nursing and Allied Health Literature (CINAHL), Public/Publisher MEDLINE (PubMed), Embase, and Google Scholar. Other websites used for the literature review included the American Occupational Therapy Association (AOTA), World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), Ontario Society of Occupational Therapists (OSOT), Rehabilitation Engineering and Assistive Technology Society of North America (RESNA), and the United States Census Bureau.

Multiple gaps for wheelchair users and those supporting them were identified through the literature search. These gaps include limited discussion of functional and social needs, lack of independence that impacts client and caregiver safety, lower life-space mobility and disability that decreases social engagement, increased risk of pressure injuries, insufficient education and training of personnel when providing seating and mobility devices impacting overall physical health, safety, quality of life, and vocational

and economic status, and lack of training that is recommended when receiving a mobility device because of competing demands being prioritized first. To address these gaps and the needs of the caregiver, the EHP framework was used to help the author understand program development. These approaches are *Establish*/*Restore*, *Alter*, *Adapt*/*Modify*, *Prevent*, and *Create*, which can be viewed in Table I with associated goals and evidence-based strategies relevant to the product.

The target audience for the product development was based on therapists that have expertise in the field of seating and mobility, the coordinators of support services, and the direct support professionals that care for and support clients that require wheeled mobility devices. The therapists defined key terminology and aspects of seating and mobility that would be important to include into the training and educational resource. There needed to be consideration for others like the coordinator of support services who typically have some level of higher education and understanding of the healthcare field. Throughout the development though there always needed to be consideration for direct support professionals as those would be the individuals using the product most often but typically did not have high levels of education and experience in healthcare. This guided the product development in that there needed to be limited medical jargon and directions that provided guidance and a clear understanding of what the training and educational resource was providing. Making it an educational resource that would benefit wheelchair users but not be too complicated and cause further communication errors and risk factors for these clients. All while being considerate and respectful to the individuals that were

using this training and educational resource, making for an engaging and helpful resource that could be used any and every client that required wheeled mobility devices.

After the initial literature review was completed and results were analyzed and synthesized, the author started the process of the Doctoral Experiential Placement in collaboration with LifeScape. The immersion began and facilitated the ability to complete several shadowing opportunities and assisting an occupational therapist in different wheelchair seating and mobility evaluations and treatments. The opportunity was fundamental for the project in that the occupational therapist specialized in the fields of assistive technology and wheelchair seating and mobility. Further opportunities brought on the ability to work on wheelchair seating and mobility treatment sessions consisting of client fitments and adjustments to new and pre-existing devices. Key stakeholders were contacted and consulted during the development process to broaden this area of expertise and to further strengthen the strategies and approaches used during the development of the product. The main stakeholders that were consulted included other occupational therapists who specialized in assistive technology and seating and mobility specialty training and certification, an occupational therapist that was the director of therapy, a physical therapist with assistive technology and seating and mobility specialty training and certification and clinical equipment specialty, a physical therapy assistant with clinical equipment specialty and a rehab technician. Discussion and collaboration with these stakeholders allowed for further examination and analysis of the literature that was

relevant and important to indicate the necessity for direct support professionals and therapy aides to have training on wheelchair seating and mobility.

Table I: The Ecological Model of Occupational and Ecology of Human Performance Framework

The Ecological Model of Occupational and Ecology of Human Performance Framework	**Goals**	**Evidence-based Strategies**
Establish / Restore The intervention approach focuses on personal factors and aims to improve the person's skills (Dunn, 2017).	Direct support professionals will ***recognize*** the appropriate and correct positioning of the client when transitioning into a manual or powered wheelchair. Direct support professionals will ***demonstrate*** appropriate skills for proper adjustment of straps and belts on a wheelchair.	Training and education resources will provide direct support professionals with the ability to restore independence and occupational engagement with proper positioning. Training and education resources will provide direct support professionals with the skills required to establish support and safety when using wheeled mobility devices.

Alter The intervention approach is where the therapist focuses on the context in which the person performs (Dunn, 2017).	Direct support professionals will ***identify*** and ***understand*** the durable medical equipment in a wheelchair that can be moved to assist with functional mobility and engagement in occupations. Direct support professionals will ***comprehend*** when a referral is required for a seating and mobility specialist.	Training and education resources will provide direct support professionals with the ability to alter the environment that provides increased independence and occupational engagement. Training and education resources will provide direct support professionals with the skills required to recognize when altering the environment is not sufficient and may require a referral to a seating and mobility specialist to change the wheeled mobility device.

		Training and education resources may be offered in an alternative location that supports increased understanding and comprehension of material for direct support professionals.
Adapt / Modify The intervention approach requires that occupational therapists change aspects of the context or adjust task features (Dunn, 2017).	Direct support professionals will ***recognize*** the appropriate and correct positioning of the client when transitioning into a manual or powered wheelchair. Direct support professionals will ***identify*** and ***understand*** the durable medical equipment in a wheelchair that can be	Training and education resources will provide direct support professionals with the skills required to modify positioning to increase independence, and occupational engagement, and decrease potential risk factors. Training and education resources will provide the knowledge necessary for supporting direct support professionals

	moved to assist with functional mobility and engagement in occupations. Direct support professionals will ***demonstrate*** appropriate skills for proper adjustment of straps and belts on a wheelchair.	when adapting and modifying equipment on wheeled mobility devices for a variety of functional occupations. Training and education resources will provide direct support professionals with the knowledge so the skills can be developed to adapt and modify straps and belts that provide the most support when using wheeled mobility devices.
Prevent The intervention approach is to preclude the development of performance problems (Dunn, 2017).	Direct support professionals will ***recognize*** the appropriate and correct positioning of the client when transitioning into a manual or powered wheelchair.	Training and education resources will provide support and skills necessary to promote optimal positioning in manual or powered wheelchairs that help prevent pressure injuries and other risk factors.

	Direct support professionals will ***comprehend*** when a referral is required for a seating and mobility specialist.	Training and education resources will provide knowledge for direct support professionals when it is appropriate to submit a referral for a seating and mobility specialist to prevent further complications.
Create The intervention approach focuses on creating circumstances that support optimal performance for all persons and populations (Dunn, 2017).	Direct support professionals will ***recognize*** the appropriate and correct positioning of the client when transitioning into a manual or powered wheelchair. Direct support professionals will ***identify*** and ***understand*** the durable medical	Creating a new training group from the direct support professionals and peers that will facilitate and assist with training new professionals utilizing the created training and education resources.

	equipment in a wheelchair that can be moved to assist with functional mobility and engagement in occupations. Direct support professionals will ***demonstrate*** appropriate skills for proper adjustment of straps and belts on a wheelchair. Direct support professionals will ***comprehend*** when a referral is required for a seating and mobility specialist.	

See Chapter II Literature Review for full analysis and findings.

Chapter IV

Product

The product Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide was developed based on the identified needs of the literature review and through collaboration with LifeScape organization. Further, the product was developed and created based on LifeScape's mission and vision which are stated below:

Mission: Empowering people to live their best life.

Vision: LifeScape will be an innovative organization, providing exceptional services and creative solutions for people with varied needs and complex care across their life span. Through collaborative partnerships, LifeScape will become a destination for research, and the development, implementation, and training of technology-based solutions to improve the lives of people we support (LifeScape, 2023).

The evaluation and processing of all literature reviewed guided analysis of the needs of the community and common supports, barriers, and concerns of individuals who have limited occupational engagement because of decreased mobility. Through the extensive literature review and collaboration with LifeScape, the identified need was identified as there was limited training for direct support professionals on wheelchair seating and mobility and positioning to prevent secondary complications which profoundly impact a wheelchair user's quality of life and overall well-being. The product

aims to educate therapy aides, direct care professionals, and therapists to consistently position all clients to prevent secondary complications as discussed in the literature review.

The purpose of the product is to provide LifeScape with a new and revamped training resource and guide that would allow for the effective training of new therapy staff, therapy aides, and direct support professionals working with wheelchair users. Having therapy team members or aides that are more adept in these skills will help train and provide resources to other direct support professionals that are fundamental to LifeScape. Allowing for more of a peer-led training system that will help others recognize the importance of properly positioning someone in a wheelchair and seating system and why this positioning is so important. The educational service delivery method will be broken down into different components. The first training resource will provide education about wheelchair seating and mobility, proper positioning, and other equipment and additional equipment that helps to properly position a client, eliminating the potential for developing other wounds and injuries, and increases the occupational performance of that person. The supplementary resource will be a simplified educational resource that the trained individual can teach to other direct support professionals to identify the proper positioning of a client, functionality of the equipment, other locations of the additional equipment, and skills necessary to make minor adaptations and modifications. It will also allow for the coordinator of support services the ability to track individual client needs

when it comes to wheelchair seating and mobility and document this easily in the clients medical chart.

The product Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide was driven based on an important aspect of occupational therapy in the realm of an occupational therapy model. The guiding model that was utilized was The Ecological Model of Occupational and Ecology of Human Performance Framework (EHP). The occupational therapy model was selected based on the three core constructs. The EHP framework guided this product by understanding the supports and barriers to providing optimal seating and positioning, and the contextual attributes of LifeScape and the agencies they work with. Through the EHP lens, this product will target intervention approaches to support those providing direct care to the wheelchair user based on the evidence, needs of the agency, and goals.

From the evidence gathered during the literature review and guidance from the occupational therapy model, the product will have a collection of goals that will be achieved through various evidence-based strategies established by the LifeScape organization and other recommendations provided throughout the literature. The overarching goal for Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide is to allow for the training of therapy aides and direct support professionals on both how to properly position someone in a wheelchair and why proper positioning is important. Therefore, LifeScape will have a program that will have an

established set of training guidelines and resources that can be utilized in multiple settings to assist in competency training with wheelchair seating and mobility and as a reference in future situations.

See Appendices

Chapter V

Summary

There are approximately 20.8 million Americans from the age of five years old to 65 plus that require some form of mobility device to complete daily activities of living (ADL) and instrumental activities of daily living (IADL; U.S. Census Bureau, 2021). This number has grown over the years in that in 2010, there were more than 3.6 million people in the United States who required wheeled mobility devices to perform ADLs and IADLs (U.S. Census Bureau, 2010). The purpose of this product was to provide support and guidance for practitioners, caregivers, and direct support professionals when it comes to working with clients that are reliant on a form of mobility device each day. This product was further refined to help strengthen and support the role of therapy aides, caregivers, and direct support professionals that work within the LifeScape organization and related community services. Through the product, Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide, there will be the opportunity to provide training, education, and resources to these personnel when it comes to the encounters that are had with wheeled mobility device users and their caregivers. The goal and objective for this training and educational resource are to allow others to understand proper positioning in manual and powered wheelchairs, the reasoning behind it, the equipment that is often part of a wheelchair, and what can be attached and removed for different purposes, how to securely support a client with the belts and straps on a

wheelchair, and when it is appropriate for a referral to a seating and mobility specialist. These goals and objectives are all supported by evidence-based literature and the expertise and knowledge of skilled practitioners that are involved with wheelchair seating and mobility. Subsequently, it will allow for reference and guidance when the coordinator of support services is providing training and assistance to direct support professionals in the community setting.

Current literature was analyzed to address the supports, barriers, and gaps experienced by individuals requiring wheeled mobility devices to complete ADLs and IADLs. The literature was further examined through The Ecological Model of Occupational and Ecology of Human Performance Framework (EHP) as Dunn (2017) described. This helped to provide guidance when determining literature that would be most beneficial for product development regarding the core constructs of the model which include the person, task, context, and overall performance (Dunn, 2017). Findings from the literature were used to develop different aspects of Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide. The product will be divided into two different components that build upon one another. These different components will consist of a training and educational presentation that addresses three different aspects including proper positioning, the why behind it, equipment on wheelchairs, and when referrals are appropriate for a seating clinic and a seating and mobility specialist. The second component will be a reference guide and checklist that will include information on specific strategies and techniques to use when working with

an individual to address the questions previously stated. To provide enough guidance and support so that caregivers and direct support professionals can maintain a client's independence and safety while using their wheeled mobility devices.

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Appendices

Appendix A

ACTING ON THE NEED OF A CLIENT, CAREGIVER, AND PRACTITIONER SEATING AND MOBILITY GUIDE

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LEARNING OBJECTIVES

- Direct support professionals will ***recognize*** the appropriate and correct positioning of the client when transitioning into a manual or powered wheelchair.
- Direct support professionals will ***identify*** and ***understand*** the durable medical equipment in a wheelchair that can be moved to assist with functional mobility and engagement in occupations.
- Direct support professionals will ***demonstrate*** appropriate skills for proper adjustment of straps and belts on a wheelchair.
- Direct support professionals will ***comprehend*** when a referral is required for a seating and mobility specialist.

DEFINITIONS

- **Direct support professional (DSP):** An individual who works directly with people who have intellectual or developmental disabilities (Regional Centers for Workforce Transformation, 2021).
- **Position:** Observation used to determine if an individual is displaying any abnormal posture (Posterior pelvic tilt, Pelvic obliquity, Pelvic rotation, Windswept posture, or Anterior pelvic tilt; Permobil, 2019a).
- **Client:** Usually classified as persons (those involved in the care of the client), groups (individuals with shared characteristics or common shared purpose), and populations (a collective group of people with common attributes; American Occupational Therapy Association [AOTA], 2020).
- **Manual wheelchair (MWC):** A wheelchair that relies on an individual or assistant for manual propulsion (Waugh et al., 2013).
- **Powered wheelchair (PWC):** A wheelchair with a type of motor power that is derived from a primary source of electric power (Waugh et al., 2013).

DEFINITIONS CONTINUED

- **Durable medical equipment (DME):** Equipment that has a medical purpose, is used in the home, can withstand repeated use, and is usually not useful to someone who is not sick, injured, or disabled (Permobil, 2019a).
- **Functional mobility:** Moving from one position or place to another (during the performance of everyday activities), such as in-bed mobility, wheelchair mobility, and transfers, includes functional ambulation and transportation of objects (AOTA, 2020).
- **Engagement in occupation:** Performance of occupations as a result of choice, motivation, and meaning within a supportive context (AOTA, 2020).
- **Strap:** Length of webbing material used for wheelchair tiedown purposes (Waugh et al., 2013).
- **Belt:** Length of webbing material used for part of occupant restrain or postural support device (Waugh et al., 2013).
- **Referral:** Transition planning that may require further evaluation to a provider within occupational therapy with advanced knowledge and skill or outside the profession (AOTA, 2020).
- **Seating and mobility specialist:** Professionals that work in seating and mobility and focus specifically on seating, positioning, and mobility (Seating and Mobility Specialist [SMS], n.d.).

TEAM

Therapist

- Assists team in providing clinical expertise about the body, understands optimal postures for function and translates knowledge to optimal seating and mobility components and properties.
- Acts as client advocate (Permobil, 2019a).

Supplier / Dealer

- Knowledge of equipment currently available, billing and insurance issues, and qualification requirements (Permobil, 2019a).

TEAM CONTINUED

Assistive Technology Professional

- Completes in-depth certification process before practice.
- Specialized knowledge of complex rehab products and equipment, qualification requirements, competent in analyzing the needs of consumers with disabilities, assists in the selection of appropriate assistive technology for consumer needs, and provides training in the use of devices (Permobil, 2019a).

Manufacturer

- Provides knowledge of products offered, clinical applications, integration of products with other technology, and all pros and cons of products for various patient presentations (Permobil, 2019a).

Centers for Disease Control and Prevention (CDC)

- Approximately 61 million adults in the United States live with a disability.
  - Approximately 26 percent of adults in the United States (Centers for Disease Control and Prevention [CDC], 2020).
  - Approximately 13.7 percent of adults living with a functional disability that impacts mobility or causes difficulty with walking or climbing stairs (CDC, 2020).

PUTTING THE IMPORTANCE INTO PERSPECTIVE

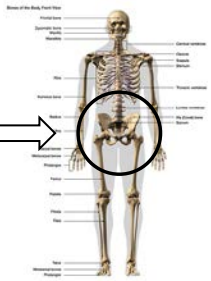
SIGNIFICANCE BEHIND WHEELCHAIR SEATING AND MOBILITY

- Individuals with limited mobility because of a diagnosed impairment or complication often result in a loss of independence and multiple hours each day in a wheelchair.
  - Long-term impacts on function and physical health.
- Wheelchair and seating interventions help to increase an individual's function.
  - Help to prevent future complications that provide optimal and aligned posture support and stability to increase functional performance and compensate for motor, sensory, visual, and cognitive impairments.
  - Help to provide equal pressure distribution, pressure relief, and mobility (Lange, 2021).

PROPER POSITIONING

- One of the first questions to ALWAYS ask:
  - When looking at the client's posture, is the body doing something that it should not be doing?
    - With prolonged sitting by a client, the client will shift the body into abnormal postures to seek stability and/or alleviate pain and pressure (Permobil, 2019a).

PROPER POSITIONING



First Place to Address

- ALWAYS start at the PELVIS:
  - Can the pelvis be adjusted and moved to a neutral position or to a comfortable position?
    - Adjustment and movement at the pelvis impact ALL other aspects of the position of the body.
- Key points of emphasis:
  - Is the pelvis positioned against the back support?
  - Identify and correct the pelvis if it is shifted laterally.
  - Does the pelvis have a neutral to anterior tilt?
- Importance of addressing the pelvis first:
  - Pelvis is the foundation for posture above and below and especially for the trunk and head.
  - Pelvis evens weight bearing and points of contact.
  - Pelvis provides stability for upper extremity function.

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REASONING BEHIND PROPER PELVIS POSITION

Pressure Injuries

- A pressure injury or known previously as pressure sores or pressure ulcers, is a localized injury to the skin and underlying tissue over a bony prominence because of pressure, or pressure in combination with shear and friction (Lange, 2021).
- The most common and prone areas to develop pressure sores are the bony areas like the occiput, ischial tuberosities, trochanters, sacrum, malleoli, and heel.
  - The most common pathway to ulceration is tissue ischemia, and if ischemia persists for one to two hours, necrosis takes place and pressure ulcers can form within one to two hours (Bhattacharya & Mishra, 2015).

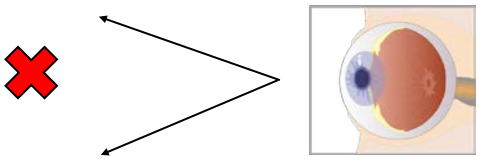
PROPER POSITION: HEAD

- Neutral position:
  - Straight over the spine and pelvis.
    - Support with a headrest if available.
- Lateral flexion to right or left:
  - Position in a comfortable location that allows for functional engagement with activities.
    - Support with a headrest if available.
      - DO NOT force into a position that causes discomfort or pain.
- Flexion or extension forward or backward:
  - Position in a comfortable location that allows for functional engagement with activities.
    - Support with a headrest if available.
      - DO NOT force into a position that causes discomfort or pain.

REASONING BEHIND PROPER HEAD POSITION

Vision

- Individuals that have limited mobility and trunk control may have limited strength in their necks.
  - Without neutral alignment to assist, these individuals may have a limited visual field that consists of looking at the floor or the ceiling.
    - Limited visual fields lead to limited new learning, social interaction, and inclusivity with these individuals (Fitzsimmons, 2014).



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REASONING BEHIND PROPER HEAD POSITION CONTINUED

Communication

- The head position is part of the quality of life for people.
- Having a good head position and the ability to look someone in the eyes is the first opportunity for any individual in connecting with another person. This is a typical indicator and initial reaction to how someone is feeling.
- Often when a head is positioned down it means that person is tuned out, not interested, or does not want to be bothered, however, this may be posturing challenges and the inability to support the head.
- Not only is a functional head position important for an individual that may rely on support in a wheelchair, but improving a person's head position will help to support breathing, swallowing, heart rate, communication, learning, visual field, the comfort of the person, and the potential for decreased influences of abnormal tone and reflexes (Fitzsimmons, 2014).

REASONING BEHIND PROPER HEAD POSITION CONTINUED

Eating and Feeding

- Flexion and hyperextension of the neck for a wheelchair user can have negative consequences with eating and feeding.
  - Neck deformities can impact the medical status, growth, fatigue, and function of an individual unable to safely consume food and gather nutrients from the food that is eaten (Fitzsimmons, 2014).
- Dysphagia, a common and increasing concern, can lead to dehydration, pressure ulcers, and malnutrition.
  - Leading to dependent eating and the ability to participate in rehabilitation and basic and instrumental activities of daily living.
- People consider eating as a pleasurable daily experience and these barriers may limit the ability of an individual to participate in social and cultural activities (Avery-Smith, 1996).

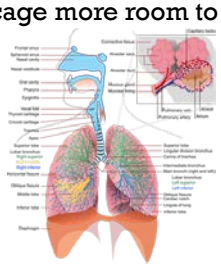
PROPER POSITION: TRUNK

- Neutral position:
  - Balanced over the pelvis.
    - Support with lateral trunk supports if available.
- Lateral flexion to the right or left:
  - Position in a comfortable location that allows for functional engagement with activities.
    - Support with lateral trunk supports based on the direction of leaning.
      - DO NOT force into a position that causes discomfort or pain.
- Flexion or extension forward or backward:
  - Position in a comfortable location that allows for functional engagement with activities.
    - Identify if the pelvis and torso are scooted completely back in the seating system to support the trunk and assist with flexion or extension.
      - Support with anterior straps/belts if available.
        - DO NOT force into a position that causes discomfort or pain.

REASONING BEHIND PROPER TRUNK POSITION

Respiratory Function

- Researchers have determined through investigation and experience 70 able-bodied individuals who are seated for a prolonged time in a slumped sitting posture had decreased lung capacity, expiratory flow, and decreased lumbar lordosis.
- An increase in spinal lordosis in the lumbar region induces a decrease in thoracic kyphosis and allows for the ribcage more room to expand during inspiration (Lin et al., 2006).



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REASONING BEHIND PROPER TRUNK POSITION CONTINUED

Physical and Cognitive Discomfort

- Emphasis placed on an individual with moderate to good core stability.
  - Powered wheelchairs are prescribed when an individual does not have the upper core strength and a full range of motion with the upper extremities.
  - Manual wheelchairs are prescribed for individuals that have more independence and can live with little to no assistance from others.

REASONING BEHIND PROPER TRUNK POSITION CONTINUED

Falls

- Falls and recurrent falls were frequent in wheelchair users with spinal cord injuries because of a lack of core stability.
  - There is a need for increased awareness about fall risk situations and the associated injuries from falls with wheelchair users (Forslund et al., 2017).

Other Risk Factors

- Prolonged sitting causes compression on the trunk and reduced function of the respiratory system and digestive systems.
  - Increases risk of pneumonia and bowel obstruction.

TOOLS USED TO HELP POSITIONING

Straps and Belts

- Positioning belt / Safety belt / Pelvic strap:
  - Provides support at the pelvis to maintain the position of the pelvis towards the back of the cushion and prevent sliding forward.
  - Positioning belt must be against the individual, or as much of the positioning belt touching the individual as possible.
  - Positioning belt should NEVER be above the pelvis.
- Shoulder harness/strap or chest strap:
  - Provides support at the shoulders and chest to maintain the position on the backrest and help with a neutral head position.
- Heel loops/holder:
  - Provides support for the feet on the footplate and prevents the feet from sliding off the footplate.

EQUIPMENT ON WHEELCHAIRS

Manual Wheelchair

- Canes.
- Back support.
- Footplate.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Arm rest.
- Seat cushion.
- Front rigging.
- Rear wheel.
- Hand rim.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Axle.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Wheel lock.
- Caster wheel.
- Lateral trunk supports.
- Lateral hip supports.
- Medial thigh support (Permobil, 2019a).

EQUIPMENT ON WHEELCHAIRS

Power Wheelchair

- Joystick / Drive control.
- Caster wheel.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Drive wheel.
- Anti-tip wheel.
- Rear tie-down bracket.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Controller (power module).
- Batteries.

EQUIPMENT ON WHEELCHAIRS CONTINUED

- Suspension springs.
- Drive wheel motor.
- Power tilt actuator (Permobil, 2019b).

GOING BEYOND THE SKILLS OF DIRECT SUPPORT PROFESSIONALS

Referral for Seating and Mobility Specialist

- A.) Capacity to perform thorough mat assessment.
  - Determines appropriate positioning and range of motion for the seating system.
- B.) Skill to simulate the desired position through the utilization of a seating simulator or trial equipment.
  - Identifies measurements and set up of seating system for the client.
- C.) Capability to utilize and interpret pressure mapping system.
  - Pinpoints specific areas of interest that may be causing pressure injuries.
- D.) Ability to apply biomechanical anatomical knowledge appropriately to the situation (movement assessment).
  - Skills required and obtained through advanced education (Isaacson, 2011).

REASONS FOR A REFERRAL

Referral for Seating and Mobility Specialist

- Referral and reassessment from seating and mobility specialist:
  - Client experiences changes that include:
    - Weight gain/loss.
    - Growth.
    - Progression of the disability.
    - Improvement in motor or sensory status.
    - Onset of new medical condition.
    - Difficulties integrating the wheelchair into new environments or activities (RESNA Board of Directors, 2011).

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Appendix B

Acting on the Need of a Client, Caregiver, and Practitioner Seating and Mobility Guide

Directions: Please use the document as a resource to check off, document, and record what wheelchair parts are currently being used with the client, record any postural support devices, straps, and belts that are used, and record any damaged or missing wheelchair parts. The document provides guidance with consideration for proper positioning strategies and techniques of the client and when a referral to a seating and mobility specialist would be recommended.

Client Name: _____

Completion Date of Form: _____

Therapist Name(s): _____ **Contact Information:** _____

_____ **Contact Information:** _____

_____ **Contact Information:** _____

Questions to Ask

□ Looking at the client's posture, is the body doing something that it should not be doing?

□ Can the pelvis be adjusted and moved to a neutral position or to a comfortable position?

Checklist

Record all equipment that is prescribed to the client and document any specific notes that must be considered with future encounters.

Manual Wheelchair:

- □ Headrest.
- □ Armrest.
- □ Leg rest.
- □ Back support.
- □ Seat cushion:
  - □ Correct orientation.
- □ Postural support device:

  Specify below:

  □ _____

- □ _____
- □ _____

□ Straps/belts:

Specify below:

- □ _____
- □ _____
- □ _____

□ Damaged or missing wheelchair parts:

Specify below:

- □ _____
- □ _____
- □ _____

Power wheelchair:

□ Headrest.

□ Armrest.

□ Leg rest.

□ Back support.

□ Seat cushion:

□ Correct orientation.

□ Postural support device:

Specify below:

- □ _____
- □ _____
- □ _____

□ Straps/belts:

Specify below:

- □ _____

- □ _____
- □ _____

□ Damaged or missing wheelchair parts:

Specify below:

- □ _____
- □ _____
- □ _____

Questions to Consider with Positioning

□ Is the pelvis positioned against the back support?

□ Identify and correct the pelvis if it is shifted laterally.

Proper Position: Head

□ Neutral position:

- □ Straight over the spine and pelvis.
  - □ Support with a headrest if available.

□ Lateral flexion (leaning) to right or left:

- □ Position in a comfortable location that allows for functional engagement with activities.
  - □ Support with a headrest if available.
    - □ DO NOT force into a position that causes discomfort or pain.

□ Flexion or extension forward or backward:

- □ Position in a comfortable location that allows for functional engagement with activities.
  - □ Support with a headrest if available.
    - □ DO NOT force into a position that causes discomfort or pain.

Proper Position: Trunk

□ Neutral position:

- □ Balance over the pelvis.

□ Support with lateral trunk supports if available.

□ Lateral flexion (leaning) to the right or left:

□ Position in a comfortable location that allows for functional engagement with activities.

□ Support with lateral trunk supports based on the direction of leaning.

□ DO NOT force into a position that causes discomfort or pain.

□ Flexion or extension forward or backward:

□ Position in a comfortable location that allows for functional engagement with activities.

□ Identify if the pelvis and torso are scooted completely back in the seating system to support the trunk and assist with flexion or extension.

□ Support with anterior straps/belts if available.

□ DO NOT force into a position that causes discomfort or pain.

Reasons for a Referral

□ Referral for seating and mobility specialist.

□ Referral and reassessment from seating and mobility specialist:

□ Client experiences changes that include:

□ Weight gain/loss.

□ Growth.

□ Progression of the disability.

□ Improvement in motor or sensory status.

□ Onset of new medical condition.

□ Difficulties integrating the wheelchair into new environments or activities (RESNA Board of Directors, 2011).

Reference

RESNA Board of Directors. (2011). RESNA wheelchair service provision guide. *Rehabilitation Engineering & Assistive Technology Society of North America.*