RESNA Position on the Application of Seat-Elevating Devices for Wheelchair Users

Rehabilitation Engineering & Assistive Technology
Society of North America

1700 N. Moore Street, Suite 1540
Arlington, VA 22209
Phone: 703-524-6686
Fax: 703-524-6630

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Wheelchair mobility is often only considered from the perspective of people moving from one point to another on a two dimensional plane[1]. Vertical movement is necessary in order for people to function and participate in a three dimensional world. A common intervention that provides vertical mobility within a wheelchair is a seat elevating device. It is RESNA's position that seat elevators are often medically necessary to assist individuals accomplish MRADLs (Mobility Related Activities of Daily Living tasks). The purpose of this document is to share typical clinical applications as well as provide evidence from the literature supporting the application of this seat function to assist practitioners in decision making and justification. It is not intended to replace clinical judgment related to specific client needs.

Definition

A seat elevator will raise and lower the user in their seated position through the use of an electro-mechanical lift system, without changing the seated angles or the seat's angle relative to the ground, in order to provide varying amounts of added vertical access. A seat elevator may elevate vertically from a standard seat height, or may lower the user closer to the floor.

Seat elevating devices address the following medical needs:

Transfers

Transferring from a wheelchair to other surfaces such as a bed, toilet, or other surface is a necessary part of the daily routine. Transferring is a mean to accomplish MRADLs and therefore it is considered a medical necessity. Seat elevating devices can facilitate safer and more independent transfers by elevating or lowering the seated height of the wheelchair. Examples of this application include but are not limited to;

- A wheelchair user is more readily able to transfer in a downhill direction using a sliding board versus uphill or to a level surface. In the downhill direction gravity assists as opposed to providing additional resistance and difficulty, as in the uphill direction.
- Transferring in a downward direction requires less upper extremity strain[2].
- Individuals with lower extremity weakness have difficulty assuming a standing position for transfers from a low seat to floor height. Rising from an elevated seat surface has been shown to require less lower extremity strength and less extension momentum at the knees, ankles and the hips [3-9]. It also takes longer to rise from a lower seat surface[10]. The use of a seat elevating device to compensate for lower extremity weakness can assist with transfers therefore prolonging independence.

Examples of such transfers include a stand pivot transfer, unassisted or with assistance.

- A seat that lowers to the floor allows some users to transfer into and out of the seat independently onto the floor or to any lower surfaces, such as a therapeutic mat table. Children or people with absent or unusually short extremities can benefit from such feature which enables them to transfer independently yet maintain a normal seated height to access everyday surfaces such as tables.

Reach

For individuals with limited reaching abilities a seat elevating device may be necessary for access to objects and surfaces within their home, work, school and community, thus improving their independence and decreasing their dependence on others. Many of these objects and surfaces are necessary to complete MRADLs for example hygiene, meal preparation, parenting, and shopping. Such areas include, but are not limited to; cabinets, sinks, grocery shelves, fire alarms, light switches, medicine cabinets, stovetops, thermostats, and service counters. Improved reach can also significantly increase a person's ability to perform work and school related activities, and their potential for integration and productivity.
Seat elevators may also help reduce upper extremity pain and help delay secondary complications to the shoulders. Studies have found an association between overhead activity and the development of shoulder pain[11], and shown that the degree of upper arm elevation is one of the most important parameters influencing shoulder muscle load[12-14]. When reaching from an elevated position, these loads are reduced, which is significant for individuals with already compromised upper extremity strength and range of motion.

Psychological considerations

Seat elevating devices also provide other benefits including;

- Eye to eye conversations are more socially appropriate and improve a person's ability to participate in social activities.
- Communication on level height may improve a person's self confidence thereby increasing their chance of success.
- Vertical mobility can raise society's expectation of wheelchair users and provide them with a more equal chance for success.

Additional physiological aspects:

When talking at eye level with others, typical hyperlordotic cervical curvatures of the spine can be reduced. This relieves strain on the neck and may help enhance vision, thus helping to prevent secondary complications.

An elevating seat may also allow a person in a wheelchair to hear and engage in conversations within a noisy environment, as well as to see and navigate more safely through a crowd of people.

Pediatric considerations:

An elevating seat allows children to transverse all vertical environments necessary to satisfy their learning needs, both from a psychological perspective and to improve physical abilities such as performing MRADLs. Children can particularly benefit from elevating seats in the following regards:

- Children learn spatial relationships and basic concepts by moving their bodies through space, which needs to include all dimensions.
- Language development comes from interaction, and young children have interactions with peers and adults and many different levels.
- It is necessary to be at peer level for social and cognitive development and avoid learned helplessness[15]. Seat to floor height for normal activities is recommended to be low due to the small size of the child. A seat that lowers to the floor can also provide access to peer activities.
- Low seat to floor height may also assist in stand pivot transfers, since small children have shorter lower extremities.
- A seat elevator allows for maintenance of low seat to floor height, yet provides MRADLs, reach and access to "adult" environments, such as a dining table, kitchen counters, bookshelves, etc. These areas are readily accessible for normally developing children as soon as they start walking and climbing. Use of elevating and/or lowering seats may stop the necessity to purchase additional equipment purely for integration purposes.

Summary:

It is RESNA's position that seat elevators are often medically necessary for wheelchair users by enabling them to reach, improving MRADL abilities, facilitating or enabling transfers, providing peer height at different ages, enhancing independence and productivity, and delaying or preventing pain and secondary complications of the upper extremities.

Case examples:

Sally is a 67 year old woman with Osteogenesis Imperfecta, right below knee amputation, limited active shoulder flexion to 100 degrees, and short stature (5 feet tall). She uses a power wheelchair due to upper extremity weakness and concerns with pathological fractures. She lives alone in an accessible apartment and is independent with all mobility related activities of daily living using the power wheelchair and seat elevator. She requires the seat elevator to perform sliding board transfers in a downhill direction as she does not have adequate upper extremity strength to slide herself across a level surface or uphill. She also requires the seat elevator to reach and carry out tasks at different surface heights specifically stove top cooking, and getting objects out of her cupboards. Without the seat elevator she would not be able to transfer herself or perform her necessary MRADLs, and would have to be living in a facility where she receives assistance.

Jim is a 42 year old man with Spastic Quadriplegic Cerebral Palsy. He spends approximately 16 hours a day in his wheelchair, which he uses for all home, work and social activities. With the help of a seat elevator he can reach objects in his home environment as well as all outside environments. In addition, by scooting forward, elevating the seat and stepping down to the ground supporting himself by the seat from behind, he is able to use a public urinal. He can than lower the seat and sit back into position. This ability saves him about 30 minutes a day, as compared to the need to get assistance and transfer onto an accessible toilet seat. This method also enables him to transfer independently without falling. Jim's MRADL abilities, independence and safety have significantly improved since the use of the seat elevator, and he became a more productive and less dependent member of society.

Jennifer is a three year old girl with Spinal Musclar Atrophy. Due to weakness in both her upper and lower extremities, she utilizes a power chair for mobility. She attends a mainstream preschool, where she integrates into all activities by elevating and lowering her seat as needed. With these features she can cover all vertical ranges; she is on the floor for circle time, she can lower to preschool tables, and she can elevate to reach objects. This integration lessens her self-consciousness, enabling her to communicate and play with the other children, gain self confidence and develop her independence. In the home environment she is given MRADL tasks to accomplish without help, so she develops a sense of independence and motivation like all other children. Through the use of the elevating and lowering feature, Jennifer has the potential to be more active and independent as an adult.

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Sackett model definition of levels:

Level I:
Evidence is obtained from meta-analysis of multiple, well-designed, controlled studies.

Level II:
Evidence is obtained from at least one well-designed experimental study.

Level III:
Evidence is obtained from well-designed, quasi-experimental studies such as non-randomized, controlled single-group, pre-post, cohort, time, or matched case-control series

Level IV:
Evidence is from well-designed, nonexperimental studies such as comparative and correlational descriptive and case studies

Level V:
Evidence from case reports and clinical examples

Authors:
Julianna Arva, M.S., ATP, Mark Schmeler, M.S., OTR/L, ATP,
Michelle Lange, OTR, ABDA, ATP, Dan Lipka, M.Ed, OTR/L, ATS

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