

MAXIMIZING PRESSURE RELIEF AND INDEPENDENCE THROUGH POWER SEAT FUNCTIONS

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Pressure injuries impact approximately 2.5 million individuals per year (Berlowitz et al., 2011), at a cost of approximately \$11 billion annually (Russo, Steiner, & Spector, 2008). While these statistics refer to the general population, individuals requiring complex rehab technologies (CRT) are often at greater risk due to impaired mobility and sensation. With such a significant cost to the individual's health and quality of life, as well as costs to the health care system, we must continually evaluate our wheelchair service provision processes. Are we utilizing available research to inform our practice decisions? (See the Clinical Perspectives article on page 34). Are we offering and using available technologies to mitigate pressure injury risk? By obtaining a thorough client history, identifying risk factors (both external and internal) and identifying client goals, a decision can be made regarding the best person/technology match while minimizing the risk of pressure injury.

MEET SARAH

Sarah* is a 29-year-old female with a primary diagnosis of spina bifida. She has been using a manual wheelchair since the age of 4. She is an active young woman and is currently a college student studying to become a teacher. She was unable to provide the exact level of her lesion but presented with upper extremity strength within functional limits, with the exception of weakness in bilateral shoulder flexion (3+/5); full trunk control; and 0/0 strength in bilateral lower extremities. Her range of motion was within functional limits. She was able to balance independently without use of her upper extremities when sitting on the edge of a bed. She presented with significant pain in her right shoulder, reporting onset approximately 12 to 18 months prior. At time of publication, she was scheduled for a consultation to determine the cause of her pain and possible treatment options. Sarah has a history of a Stage 4 pressure injury at her right ischial tuberosity (IT) in 2010. Per her report, the etiology was unknown. She reports the pressure injury was starting to heal, became infected and ultimately required a myocutaneous flap surgery. In addition, she reported multiple Stage 1 and Stage 2 pressure injuries since that time, both at her right IT and elsewhere, which she usually addresses by “staying in bed until the area is healed.” When asked how she has been relieving pressure, Sarah stated she “moves around as needed.”

*Client name changed for confidentiality

EVALUATION

Sarah was seen by an ATP and physical therapist for a wheelchair evaluation. At the time of the evaluation, she was using an optimally configured K0005 manual wheelchair with an air-cell based cushion and adjustable tension back support. Sarah presented with several postural asymmetries, including: right pelvic obliquity which was flexible towards neutral, right thoracic convexity, limited hip flexion to approximately 70 degrees bilaterally, excessive lumbar lordosis, redundant tissue at posterior buttocks, and a tendency to sit with bilateral lower extremities in external rotation. Using the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2001) to guide the evaluation process, the following areas of concern were identified addressing body functions and structures, activities and participation, and the external environment/equipment:

PROBLEM LIST

1. History of multiple pressure injuries – Sarah has experienced multiple pressure injuries, likely in large part due to her limited mobility, impaired sensation and the presence of external risk factors including shear, pressure, friction and microclimate.

2. Significant right shoulder pain – Manual wheelchair propulsion for 25 years in conjunction with transfers and reaching overhead have contributed to repetitive strain injury and severe right shoulder pain.

3. Difficulty with uneven transfers – Due to Sarah’s limited mobility and upper extremity pain, she is experiencing increased difficulty with uneven transfers.

4. Unable to reach all surfaces in her environment for completion of activities of daily living (ADLs) and instrumental activities of daily living (IADLs) – Due to upper extremity pain and the seat to floor height required for propulsion of her manual wheelchair, Sarah was unable to access all desired surfaces during daily activities.

5. Unable to independently access all desired environments/terrains due to UE pain and fatigue – Sarah was having trouble navigating desired environments in her manual wheelchair.

GOALS

The following goals of the seating and mobility intervention were identified in conjunction with Sarah:

1. Independent mobility in all desired environments/terrains.
2. Improve access to all aspects of environment for independence in ADLs/IADLs.
3. Reduce strain on upper extremities during mobility and daily activities.
4. Reduce risk of pressure injury.

INTERVENTION

Based on the identified problem list and goals, it became clear that Sarah’s current wheelchair was no longer meeting her needs. While her manual wheelchair allowed for independent mobility on flat surfaces, it did not allow for independence in all desired environments. Furthermore, it did not allow her to change positions throughout the day, both for pressure relief and for reduction of upper extremity strain during completion of daily activities.

For these reasons, it was recommended that Sarah participate in a power wheelchair evaluation. An in-home evaluation was completed by both the ATP and physical therapist to assure that recommended equipment would work within her home environment as well as desired community environments. Given her tight indoor environment, and her experience during the wheelchair evaluation/equipment trial, Sarah selected a midwheel drive base. Due to her outdoor terrain, and desire for improved suspension as well as higher top speed, a Group 4 power wheelchair was identified as being most appropriate. Sarah regularly navigates uneven terrain while accessing her college campus and work. In addition to the power wheelchair base, a positioning back support and skin protection/

positioning cushion were recommended due to Sarah’s lordosis and history of pressure injury on her sitting surface. Finally, the following power seat functions were recommended:

- Power Tilt (including 20 degrees of anterior tilt) – Due to high risk of pressure injury and difficulty with independent pressure reliefs (inadequate “lift” achieved due to upper extremity pain/fatigue), posterior tilt was recommended. Sarah was also educated on the application of minimal posterior tilt for postural stability when navigating uneven community environments. Anterior tilt was also recommended to achieve more functional reach for completion of ADLs/IADLs, including computer access for her school work.

- Power Recline – To optimize pressure relief and to allow for dynamic postural changes throughout the day for independence and improved sitting tolerance, particularly given her limited hip flexion.

- Power Elevating Legrest – For use in conjunction with power recline for pressure relief. While Sarah’s range of motion was within function limits for seating, when using a significant amount of recline, power elevating legrests were required to maintain pelvic position.

- Power Adjustable Seat Height – To achieve even transfers and improve access to environment for ADL/IADL participation.

After the equipment evaluation, results from the therapy evaluation, justification, and face to face physician examination were submitted to Sarah’s insurance (Medicaid). At that time, Sarah was educated on the potential for denial of the Group 4 base, as well as the power adjustable seat height. Her insurance did approve all recommended items. Sarah received her Group 4 power wheelchair approximately two months ago and reports improved environmental access, participation in daily activities and completion of pressure reliefs. At time of initial delivery, she declined the use of additional technologies (pre-programmed power seating sequences)

MAXIMIZING PRESSURE RELIEF ... (CONTINUED FROM PAGE 43)

to ease pressure management, however, was open to considering these technologies in the future. She reported the power adjustable seat height as the most useful new feature on her power wheelchair. Unfortunately, Sarah chose to remove her head support despite education on the importance of using the head support when completing an adequate pressure relief.

TECHNOLOGIES TO PROMOTE SUCCESSFUL IMPLEMENTATION OF PRESSURE RELIEF ROUTINES

Sarah is an example of how a good person-technology match can result in improved quality of life and health. However, literature tells us individuals do not complete pressure reliefs as recommended (Sonnenblum & Sprigle, 2011). A survey completed in 2017 (Wicks, Cerrato, Eaneff, Leire, & Handersson-Svahn, 2017) reported that 89 percent of clients did not complete a pressure relieving routine as prescribed, the most common reason (68 percent) being that they forgot. As individuals involved in the provision of CRT, we must do what we can to apply available technologies to help end-users successfully complete recommended pressure relieving routines. Some available technologies that are often no additional cost include:

- **Memory Seating or Independent Repositioning Mode (IRM)** – There are clear recommendations regarding amount of tilt and recline required for adequate pressure relief (Dicianno et al., 2015) as well as the order in which power seat functions should be utilized (Kreutz, 1997). Using included power wheelchair features, such as IRM, can make it

easy for the client to implement a successful pressure relieving routine. One push of a button or deflection of the joystick can take the client back into the recommended position, using the correct sequence of actuators – tilt, elevating legs and recline. This eases ability to complete recommended pressure reliefs, helps reduce risk of shear and aids in maintaining pelvic alignment.

- **Assignable Buttons** – The ability to fully customize the joystick buttons or provide an external switch for easy access to seating functions can be important for some users with limited upper extremity function or cognitive deficits. When used in combination with IRM, this gives the client a direct and easy way to complete the recommended pressure relieving routine.
- **Virtual Coaching** – When used in conjunction with a clinician, virtual coaching gives the client real time reminders and coaching to his or her optimal position for pressure relief. Feedback on percentages of pressure reliefs completed is also provided, giving the client and clinician objective information on the amount of pressure relieving activity (including seat actuator angles for the clinician) completed throughout the day.

While these technologies are readily available, these options often get overlooked in the delivery process. Application of these technologies can mean the difference between success and failure in the client's pressure relieving routine. As equipment providers and clinicians, we can arm our clients with a variety of strategies and technologies. Ultimately, however, it is they who must take ownership and carry out the recommendation. Let's do what we can to help shape their path to success!

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Angela Regier, OTD, OTR/L, ATP/SMS, received her Doctor of Occupational Therapy from Creighton University in 2007 and is a RESNA-certified Assistive Technology Professional (ATP) and Seating and Mobility Specialist (SMS). Her career has focused on neuro-rehabilitation, both inpatient and outpatient settings, specializing in wheelchair seating and mobility. She is passionate about the importance of clinicians being actively involved in the provision of complex rehab technologies to maximize independent mobility and functional outcomes. Regier is a regional clinical education manager for Permobil.



Laura Morgan, PT, DPT, MSPT, ATP, completed her master's in 2005 and doctorate in 2012 in physical therapy from Boston University. She worked at Roper Rehabilitation Hospital in Charleston, South Carolina from 2005 to 2009 and first learned about wheelchair seating at the MUSC Wheelchair Seating Clinic. This work encouraged her to pursue her Assistive Technology Professional (ATP) certification in 2007 and continue to improve the wheelchair ordering process for clients. Morgan worked for large hospital systems for several years but learned their processes did not always meet the individual needs of the wheelchair user. Physical therapists often were recommending equipment with limited understanding of the patient's home environment. Patients also had difficulty returning for follow up appointments for assessment of fit and training on new equipment. Morgan founded Life Wheels On, PC, in 2012 as a way to solve both these problems by having the wheelchair assessment and training in the client's home environment. She is the owner and lead physical therapist of Life Wheels On from 2012 to the present.

