

# TRANSITIONING FROM A MANUAL TO A POWER WHEELCHAIR

## A CASE STUDY

*President Theodore Roosevelt's wood and cane wheelchairs come to mind when we think of the early American wheelchair. In 1933, Everest (who was physically disabled) and Jennings, also known as E&J, manufactured the first folding wheelchair. The "electric" powered wheelchair was invented in 1953 by George Klein to assist injured veterans after World War II. In time, new developments such as belt drive, electromagnetic and gyro powered wheelchairs were manufactured for patients unable to self-propel the manual wheelchair.*

Today, custom wheelchairs feature a variety of innovative designs and lightweight materials. Mechanical and power assist provide a broader range of clients with the ability to use a manual wheelchair and reduces risk of injury secondary to self-propulsion. Current power wheelchairs offer advanced electronics such as alternative driving methods, infrared transmission and Bluetooth technology to access computers and mobile technologies. Power positioning features include tilt, recline, precline, standing and seat elevation.

Despite these advances, the end user's transition from a manual wheelchair to a power wheelchair is often challenging. Although appropriate seating can be provided in either a manual or power base, many other factors must be considered when making the transition. Some of the challenges of power wheelchairs include size, footprint, accessibility and even stigma. Many active end users with lightweight folding manual wheelchairs have adapted their lifestyle, environment and vehicles to this mobility base.

A power wheelchair typically has a larger base, is heavier due to motors and batteries, needs to be charged, has a definitive range on a charge, and is not as easily transported as a manual wheelchair. Vehicles with ramps or lifts are necessary to transport a power wheelchair. End users who self-propel are active in their manual wheelchair and are more physically passive in driving a power wheelchair.

Funding sources need justification as to why a power wheelchair is necessary for mobility. The most common reason is that the end user is unable to self-propel any (including ultra-lightweight) manual wheelchair. In medical documentation, clinical and functional reasons why an end user is unable to push the manual wheelchair must be provided. These reasons may range from shoulder pain to paralysis of the upper extremities. End users who may require a power wheelchair have diagnoses including, but are not limited to, cerebral palsy, muscular dystrophy, spinal cord injury, traumatic brain injury, amyotrophic laterals sclerosis, multiple sclerosis and many other orthopedic or neurological diagnoses.

### LINDA

In 1980, Linda had a fall from the second story ledge of her house that resulted in a T7-T10 incomplete spinal cord injury (see Picture 1). She stated that she simply blacked out and found herself on the ground, barely conscious, talking to her 8-year-old son, and then remembers being in the hospital for a lengthy stay. After discharge, she went to a rehabilitation facility for more than two months to work on all aspects of her Activities of Daily Living and transfers, as well as to be fitted for her first wheelchair.

Linda was discharged from the rehabilitation facility with a heavy, standard rental manual wheelchair. Soon thereafter, she received her first lightweight custom manual, a Quickie. As a wife and mother she needed a lightweight wheelchair to keep up with her busy life. Eventually, she would replace her first lightweight Quickie with similar models. In 2005, she developed severe pressure injuries resulting in a coccyx flap surgery and her physician, being very concerned about her seating, recommended an appropriate pressure management seat cushion.

In 2009, she was referred to our clinic for a wheelchair evaluation. Linda informed us that she also had rotator cuff surgery on one shoulder. Her



PICTURE 1

physician requested an evaluation for a power wheelchair. Linda resisted the idea of a power wheelchair and insisted on a replacement lightweight custom manual wheelchair.

Many long-term manual wheelchair users have difficulty transitioning to power wheelchairs. Linda was no exception – she informed both our clinic team and her physician that she did not want power and she continued to use her manual wheelchair with a new pressure management seat cushion – a high profile single valve ROHO (see Picture 2).

Many years later, she contacted her physician to request a replacement manual wheelchair, since her third Quickie was in disrepair. It has been 37 years since her accident, and Linda continued to push her manual wheelchair throughout the day as much as she could. However, there were many days that she would ask her husband Roger to push her when she fatigued, was in pain, or while crossing challenging terrain such as gravel or grass.

Now at 75 years old, Linda realized that, due to many years of self-propulsion, shoulder surgery and the natural aging process, her goals needed to change. Her new goal in clinic was to gather information about the latest mechanical and power assist technologies. She was hoping that these “power” wheels would ease the pain she was experiencing in her shoulders while self-propelling, as she wanted to continue to be mobile in a manual wheelchair.



PICTURE 2

During Linda’s clinic evaluation, many options were discussed: mechanical assist such as the Widget and Magic Wheels, as well as power assist such as Smart Drive, Extender, e-Motion and Twion. Typically, long term manual wheelchair users are ideal candidates for power assist. These end users have developed certain daily routines including how they negotiate throughout their environments and transport their manual wheelchairs. The latter is often the main reason manual wheelchair users don’t want to transition to power wheelchairs. Transportation is always discussed in clinic, and we inform our clients that most power mobility devices don’t fold like manual wheelchairs and alternate transportation, such as accessible vans with ramps or lifts, is indicated. Linda already has an accessible van with a ramp, so transportation was not an issue for her.

Linda’s primary concern when coming to clinic to discuss wheelchairs was her shoulder pain. In our Seating and Mobility clinic, we did a task analysis of Linda’s stroke when pushing the wheels of her manual wheelchair. The movements were broken down in terms of body mechanics with focus on the upper extremity. Starting with the backward reach, hand to wheel contact, push and follow through, we analyzed and demonstrated each stage (see Pictures 3 and 4).



PICTURE 3



PICTURE 4



PICTURE 5

Picture 1: Linda

Picture 2: Linda in her third generation Quickie custom manual wheelchair with ROHO post coccyx flap surgery

Picture 3: Push analysis: “hand on the wheel” position on the backward reach, starting the push

Picture 4: Push analysis: follow through at the end of the push cycle

Picture 5: “Custom footrest” replacement in progress; Linda successfully driving her power wheelchair

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It was determined that the same shoulder motions were used for pushing a manual wheelchair with or without power assist and neither the mechanical nor the power assist wheels would minimize Linda's shoulder pain. The assisted wheels increase the distance achieved from a push, reducing energy exertion, however the same shoulder motion is required. The gear assist wheel has a ratchet feature that prevents backwards rolling, especially helpful on a grade, but does not change the biomechanics of self-propulsion.

Once again, her physician recommended a power wheelchair, but the thought of a larger wheelchair with batteries and motors, increasing the footprint of her chair, along with the stigma of a more disabling "look," made a power wheelchair undesirable to Linda, and she did not embrace the transition.

The supplier did a home visit to show her the smallest, most lightweight power wheelchair that disassembled and fit her petite 5-foot stature. A pressure management cushion would be provided for seating. She agreed to this power wheelchair when he demonstrated the maneuverability and the accessibility throughout her home. However, when it was time to order this power wheelchair, Linda decided to order another custom manual wheelchair instead.

Pushing continued to be more difficult and painful over the next few years. Finally, Linda made the decision to order the Group 2 power wheelchair. In the process of funding, ordering and just about the time of delivery, Linda had a stroke and was hospitalized. Her weaker side prevented efficient self-propulsion and her endurance was compromised, especially in the community.

After her stroke, she spent two weeks in rehabilitation. When the physical therapist transferred her into a power wheelchair, Linda was encouraged to drive, but instead burst into tears when the reality hit that a power wheelchair would provide her better independent mobility than her manual wheelchair. Linda said that she went back to her room and turned circles in the power wheelchair just to burn off her stress and disappointment. However, now more than ever, a power wheelchair would be more functional than a manual wheelchair after this second rehabilitation experience and a new diagnosis of upper extremity weakness.

In the beginning of 2016, Linda accepted the power wheelchair to keep her independent mobility due to her change in condition after the stroke (see Picture 5). She's had her power wheelchair for about a year now. Soon after receiving her power wheelchair, she quickly adapted to driving and was happy to find her shoulder pain manageable. In a recent visit to her home, Linda demonstrated safe, skillful driving in and around her home. Linda says she often goes back to her custom manual in the home to keep as active as possible. Her positive attitude and bright spirit keep her going strong no matter what her physical challenges may be.

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