

"We won't leave you stranded!"

Assessment guide for standing wheelchairs

Foreword

Humans are designed for movement and continuous exercise (running, walking, standing).

The human body has adapted to this over 30,000 years. All of our body's physical and even mental functions have developed in response to this posture. Joints, muscles, ligaments, internal organs, digestion and breathing are closely linked to this blueprint of our body. Permanent deviations from this blueprint inevitably lead to physical problems as well as to incorrect and excessive strain in our physiology.

We have known these sentences for years. Many of us have already been confronted with them in back schools, spine courses or in physiotherapy.

Health insurance funds promote courses and measures that encourage employees to move more and sit less. Workplace health promotion supports employees with predominantly sedentary jobs in the purchase of desks or desk attachments that enable employees to perform work while standing. Recent studies by the World Health Organization (WHO) prove beyond doubt that too much sitting now costs our health systems almost as much as smoking! This fact is not being questioned and fortunately all funding agencies are investing in measures to counteract this.

But what about people who can only sit due to illness, injury or disability, i.e. who are dependent on a wheelchair?

639 Human muscles are not made for permanent sitting (also and especially not in a wheelchair). 40% of our muscles need to be moved. If this is not guaranteed, they atrophy, shorten, cramp and/or hurt. A large part of our internal organs are functionally dependent on the verticality of our body. Breathing, metabolism, blood circulation and blood pressure regulation, digestion and excretion can be extremely impaired by permanent sitting. Especially in the case of diseases and disabilities where these functions are already impaired by the underlying disease, it is extremely important to consciously counteract this with the provision of aids.

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1. Medical-therapeutic basics

1.1. Pulmonary ventilation and respiratory dynamics

Our breathing is largely determined by the diaphragm and the intercostal muscles. By tensing and relaxing these muscles, a negative pressure is created in the lungs through which we breathe in and out. If these muscles are weakened by a disease (e.g. ALS, Duchenné muscular dystrophy) or if they are impeded by external factors (e.g. massive scoliosis), the lungs can no longer ventilate sufficiently. This leads to a lack of oxygen in the blood. At the same time, not enough carbon dioxide can be released. At the same time, this lack of ventilation of the lungs creates the ideal breeding ground for serious infections, as secretions and aspirated fluids or food components are not coughed up effectively and pathogens and other germs can multiply unchecked in the poorly ventilated areas of the lungs.

But how does standing help us to improve breathing? When sitting, there is increased pressure in the abdominal cavity due to a shift of all internal organs slightly upwards. A healthy diaphragm can work against this increased pressure. However, if the diaphragm is already weakened by the underlying disease, it can no longer do this. Stretching the whole body while lying down already reduces this increased abdominal pressure, but here the abdominal wall has to lift against gravity. When standing, the internal organs shift downwards with the help of gravity and create space for the diaphragm dynamics, so that it is easier to breathe in. This has been clearly proven by relevant studies and helps many sufferers to remain independent of external ventilation over a long period of time. Supporting the arms with optimally positioned armrests when standing also helps to activate the intercostal muscles, which deepens breathing even more.

Testimonial:

"Being able to stand on my own several times a day has made it possible to reduce the need for cpap ventilation by half during the day. In addition, I feel many more fit than before."

Christopher 19, Progressive Muscular Dystrophy Duchenné.

FACTS

In a study of patients with spinal cord injuries, 31% of respondents reported improved breathing when standing 2, 3, 18.

1.2. Muscles, tendons, ligaments, contractures and spastic patterns

As mentioned earlier, many of our muscles and joints require movement. This means that if they are not moved through their full range of motion, functional problems set in. The result is shortened muscle fibres, joint capsules, tendons and ligaments. All these structures later stick together and fuse with each other, which leads to a severe restriction of movement and pain. The body registers this unnatural condition through its sensitive fibres and reports this in the form of pain. These adhesions (contractures) can later only be released by very complex, expensive surgeries.

The risk of contractures caused by sitting for long periods of time is extremely increased, especially in patients with spasticity (increased basic tension of the musculature that cannot be influenced voluntarily). Functionally, this can be prevented or counteracted very well by independently assuming an extended lying or standing position.

Disease patterns that can lead to these massive contractures (not least due to spastic patterns) include amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), cerebral palsy (CP), muscular dystrophy Duchennè and paraplegia. It is important to mention here that for many users with the above-mentioned illnesses and disabilities it is advantageous or even absolutely necessary to come to a standing position from a lying position. Through this intermediate step, the affected joints, tendons and ligaments are brought into a stretched position without (weight) strain, which prevents injuries and pain. Afterwards, the body can be verticalised as far as tolerated without joint dynamics.

Most studies on this topic list the positive effects of standing trainers, when used for ½ hour daily. However, these standing trainers are usually only used in therapy. The significantly more effective results can be achieved self-explanatorily if the users are able to independently assume a functional standing position several times a day and in everyday situations. In this way, standing is tolerated much better, as it has a causal benefit and is not solely a therapeutic tool.

Testimonial:

"Since I've been able to get back to standing independently with my standing wheelchair, the spasticity in my feet and legs has reduced significantly and my knees stretch better."

Margitta 45, multiple scoliosis for 15 years, completely wheelchair dependent for 7 years.

FACTS

Various studies on the effects of therapeutically guided standing describe the positive effects on the muscular, tendon, ligament and capsule apparatus as well as on the unregulated increased muscle tone in neurological diseases (spasticity) 4, 5, 6, 7, 15, 18, 24

1.3. Bones

Like our flexible postural apparatus (muscles, tendons, ligaments, capsules), our static postural apparatus (bones, cartilage, i.e. our skeleton) is also dependent on the verticalisation of our body. All bones in our body depend on pressure (through gravity and movement) and traction (movement and traction through muscles and ligaments) in order to grow or retain their mineral structure.

This is undoubtedly described by medical examinations of people who have spent longer periods of time in zero gravity environments or have been unable to put weight on an entire limb due to immobilisation. Of course, these principles also apply to people who are unable to stand independently due to disabilities, injuries or illnesses.

Of course, factors such as hormonal changes, vitamin D and calcium deficiency also play a role in sufficient bone density, but we do not want to discuss these in detail here.

Importantly, lower bone mineral density significantly increases the risk of fractures (even from minor trauma). In addition, some joints in our body are not fully developed at birth. These joints (e.g. the hip joint) develop their full function and strength only after verticalisation and the associated load. If this verticalisation does not happen or is not possible, it leads to malformation and incorrect loading which can cause premature wear and tear as well as dislocations in these joints that require treatment.

Fractures in children with cerebral palsy: a total population study - Developmental Medicine & Child Medicine (2013), 55, 821-827 shows impressively that children in GMFCS stages IV-V had stunted growth and were at increased risk of fracture. In children who used standing aids, the number of fractures without trauma was four times lower. Regular weight-bearing exercises could prevent fractures in severe CP.

Cross-sectional patients who stood for more than 1 hour per day and at least 5 days per week had significantly higher bone mineral density in the lower extremities after 2 years than patients who did not stand.

Testimonial:

"In a fall from my manual wheelchair, after 20 years with a high cross-section, I fractured two vertebrae and my thigh due to osteoporosis. In addition, my rotator cuff of the right arm tore, which made it impossible to drive with an active wheelchair. Since then, I have had an electric standing wheelchair, which I use several times a day to bring myself up to standing position by lying down. Since then my osteoporosis in the legs and WS has improved."

Richard 52, incomplete cross-section C4/5

FACTS

In the attached studies, the influences of different wheelchair dependencies on bone growth, joint malformations and bone demineralisation were investigated and clear correlations were found. In addition, the positive effects of standing were documented in the study. Participants of different ages and disability/disease types with regard to bone growth, bone mineral density and joint malformations. 10, 11, 12, 13, 14, 18

1.4. Blood and lymph circulation

The human cardiovascular system is divided into two sections. The "small cardiopulmonary circulation", in which oxygen-poor blood is pumped from the right ventricle of the heart to the lungs to release carbon dioxide and take up oxygen. From the lungs, the oxygen-rich blood is transported back to the heart, where it then enters the "great circulation" and supplies all organs with oxygen, among other things. So it should be clear that any kind of lung problem has a direct influence on our circulatory system as well. This brings us back to point 1.2 (*lung ventilation and breathing dynamics*).

Furthermore, in the "great bloodstream" we have the arterial and venous vessels. Arteries are large vessels that carry oxygen-rich blood away from the heart. The blood flow is promoted by the pumping activity of the heart and by muscles in the arteries themselves. Veins carry deoxygenated

blood from the periphery of the body back to the heart. This blood flow is mainly ensured by venous valves and the so-called muscle pump. This means that when the skeletal muscles contract, veins are compressed and thus the blood is forced through the venous valves, which only allow blood to flow in one direction.

Prolonged sitting in general significantly slows down venous return, especially from the lower extremity. Especially when branches and "nodes" of the venous system in the hip and knee joints are constricted by permanent sitting and additionally the muscle pump does not work or does not work sufficiently.

This venous blood flow slowdown poses some dangers, especially for people who are dependent on a wheelchair due to illness, disability and/or injury.

The risks are: increased tendency to clot and thus risk of thrombosis (formation of blood clots in the veins, which can lead to blockage and inflammation of the affected vessel) as well as (pulmonary) embolisms (dissolution of a blood clot), which can then cause blockage of an artery (mostly pulmonary artery). These are life-threatening conditions.

Closely connected to the "great bloodstream" is our lymphatic system. This plays a major role in our immune defence. It transports lymph from our extremities via lymph nodes into our venous bloodstream and, in addition to immune defence, also has a fluid-regulating function. Lymph is also mainly transported by the muscle pump and can be inhibited by disturbances in the venous blood circulation. One consequence of this are edema in the extremities, which in turn can lead to skin and tissue defects (injuries).

How can a standing wheelchair provision now help with problems in these two systems?

To be honest, the activation of the muscle pump in patients with complete paralysis of the lower extremity is rather questionable and from a medical point of view, prolonged "non-muscular" standing is even rather negative for venous blood flow and lymph drainage. However, the combination of therapeutic standing and the possibility of using a multifunctional standing wheelchair to assume a vein- and lymph-draining position (shock position) and to do this independently and several times a day clearly explains the therapeutic purpose.

Other standing trainers and standing tables do not offer these possibilities. Especially because these can usually only be used together with nursing staff or therapists and the standing phases are (can be) used for far too long at one time and, unfortunately, far too seldom on a weekly basis.

In addition, it must be made clear that not only completely paralysed patients are supplied with a standing wheelchair, but also user groups who are no longer able to stand and walk independently due to neurological diseases, but still have activatable muscles in their legs. For these user groups, the activation of the muscle pump does work.

However, the same restrictions must be made here as with completely paralysed people. Passive, non-independent standing in a standing trainer, which is performed too seldom and for too long at one time, is rather counterproductive for the draining effect. This is especially true if no draining

position can be taken afterwards. This fact has also been known in occupational health care and occupational medicine for a long time and active promotion measures are initiated and subsidised by cost units. Unfortunately, however, these findings do not seem to count in the provision of aids so far.

Finally, it should not go unmentioned that so-called pressoreceptors are significantly involved in blood pressure control and regulation. Such pressoreceptors are located under the soles of our feet and thus also regulate our blood pressure when they are activated in a closed kinetic chain. Many people who have not stood for a long time get problems with their circulation (dizziness, nausea, drop in blood pressure) when they come to a standing position. In this case, a multifunctional standing wheelchair, which moves from a lying position to a standing position, can be used to slowly approach a complete verticalisation, especially several times a day and independently.

In a standing trainer or tilt table, these possibilities are severely limited, as one is usually dependent on assistance and thus the times for training are severely limited. If the person gets dizzy while standing, the exercise is often stopped and not repeated until the next training session. Here you start from scratch every time.

Testimonial:

"Since I am completely dependent on a wheelchair and can no longer stand on my own, I have always felt dizzy in therapy when I stood up and had to struggle with edema in my legs. Since I got my SKY, I hardly have any problems with that. "

Karin 58, Multiple Sclerosis

FACTS

The respondents included people between the ages of 2 and 86. The most frequently cited reasons for standing were to improve circulation and well-being and to reduce stiffness. 2, 3, 17, 19

1.5. Pressure Relief

According to figures from the governmental health advisory board, there are over 400,000 newly documented pressure injury cases in Germany alone (whereby the number of unreported cases must be estimated at another +10% of these cases). This results in an estimated 1.0 - 2.2 billion € in costs for our health care system, which is slightly more than half of the costs for the entire annual provision of medical aids. Just let that sink in! The development of pressure problems has been documented in numerous studies (see appendix).

The main risk factors are: Pressure over a period of time, shearing effects on the skin as well as a harmful microclimate for the skin (stagnant heat, moisture build-up, infectious agents). In the conclusion, on which most of the current studies are based, pressure problems can be prevented by avoiding/ reducing these risk factors.

- Pressure: In nursing as well as in the provision of aids, we mainly rely on pressure relief through special materials, but ideally on repositioning or relief (*patients who are dependent on wheelchairs should be instructed to "push themselves up" or lean forward every 15 minutes*)

(Takahashi, Black & Gefen 2010). Many people with the aforementioned medical conditions are not able to do this manually. For this reason, the recommendation for electric seat adjustments (electric tilt, electric back adjustment (sometimes in combination for effective relief) as well as the complete reclining option and, of course, the electric standing function is obvious. Ideally, as already described, in combination with each other.

These electrical adjustments cause the user's weight to shift and thus relieve pressure on the sensitive areas of the body. In this example, too, one must clearly question systems that users cannot use independently and on their own responsibility several times a day or even hourly. Studies clearly show that the time factor of pressure-relieving positioning plays a decisive role.

- Shear effect: With regard to a multifunctional wheelchair fitting, it is extremely important to look at the different pivot points of the user and the wheelchair. The pivot points should be as close as possible or compensated for by biomechanical length compensation. This is what modern standing wheelchairs offer! Affected persons do not have to make a difficult transfer, which in turn carries the risk of shearing forces.
- Microclimate: This factor in the development of skin defects can also be significantly influenced by storage. Modern air-conditioned seating solutions, such as those already available in the automotive industry, cannot be used for various reasons (economy, but above all the high power consumption). Thus, the most effective option is relocation to avoid humidity, heat accumulation and microbial nutrient arc. This can also be achieved to a large extent by the standing position. Again, however, only if this is done regularly and independently (if necessary) over an adequate period of time.

Testimonial:

"By being able to change my position in my standing wheelchair several times an hour and standing more often during the day, I have not had a pressure sore in all the years I have been in the wheelchair and can reduce the pain in joints and sensitive skin areas to a tolerable level. "

Jano 23, Progressive muscular dystrophy Duchenné

FACTS

The normalised sitting loads showed strong linear relationships with the angles of change for tilting, reclining and standing in both groups. The maximum decrease in sitting load occurred during full standing and full reclining for the cross-sectional subjects and during full standing for the able-bodied subjects. The load on the back increased linearly in both groups when tilting and leaning back and decreased linearly when standing. 22, 26, 27, 28, 29

1.6. Improvement of bladder function

Our bladder is an organ that is very strongly influenced by our nervous system. Most functions happen involuntarily, only the external sphincter and the pelvic floor muscles can be voluntarily relaxed, which makes spontaneous emptying of the bladder possible. The urinary bladder serves to absorb and collect the urine produced by the kidneys. The urine serves, among other things, to flush

excess or broken down minerals out of the body. The smooth wall muscles of the bladder expand as soon as the bladder fills. When the bladder is emptied, the smooth muscles of the bladder wall involuntarily contract again. Position and shape have naturally adjusted to this with the verticalisation of our body. As long as we are healthy, the bladder also functions in other positions. However, if the involuntary functions are disturbed by an injury to the spinal cord or by other neurological diseases, problems can arise.

Disorders of bladder function:

Urinary/renal stones:

Urinary and kidney stones form, among other things, due to a high concentration of minerals in the urine (e.g. hypercalcaemia/hypercalcuri) and/ or when residual urine constantly remains in the bladder and the mineral components crystallise out. The cause of a high concentration of minerals in the urine is repeatedly described in wheelchair-dependent persons. Since there is an increased breakdown of calcium by osteoclasts due to a lack of stress on the bones (osteoporosis, among other things), this calcium is excreted through the urinary system. In combination with other minerals and with the problems described above, urinary stones can then form from these minerals. As a rule, urinary stones that have formed in the bladder can be excreted in the normal way. Above a certain size, however, this can be very painful and cause injuries in the urethra and inflammatory processes in the bladder that require medical intervention.

Cystitis:

As just described, bladder infections can be caused by urinary stones. The more common case, however, is that harmful germs get into the bladder and multiply there unchecked. This happens mainly when, due to physical limitations and poor conditions (see also microclimate), sufficient intimate hygiene is not guaranteed. This is especially the case when affected persons empty their bladder with draining incontinence methods (permanent urethral catheters or self-catheterisation). Here, too, one of the greatest risks is when the bladder cannot be emptied completely, i.e. residual urine remains in it. This residual urine forms the ideal breeding ground for germs.

Avoiding the complications of impaired bladder function:

As with all physical problems, the best approach is to avoid the causes. Here are some examples:

1. Avoidance of increased bone loss (osteoporosis)
Section 1.4
2. Complete bladder emptying
Particularly in the case of diseases that result in a flaccid (hypotonic) bladder wall musculature, complete emptying of the bladder in a sitting position is very difficult. The rear part of the bladder "tilts" backwards when sitting, causing residual urine to collect there. For men in particular, emptying the bladder while standing promises the best chance of success, so that the bladder can be emptied completely. This prevents germs from multiplying and minerals that need to be flushed out are completely excreted.
3. Creating good hygienic conditions (microclimate in the intimate area)
Maintaining good physical hygiene is difficult enough for many of those affected due to their physical limitations; if, in addition, a poor microclimate (heat and moisture build-up) caused

by permanent sitting is added, it can hardly be avoided that germs multiply in this area and can also enter the draining urinary tract. Here, too, independent, frequent, therapeutic standing offers an ideal prerequisite for avoiding these factors for complications and secondary diseases.

Testimonial:

"I used to have bladder infections all the time. Since I got my standing wheelchair, these problems hardly ever occur. "

Isabel 34, high cross-section C3/C4

FACTS:

Kaplan et al. reported as early as 1981 that standing exercises had a positive effect on urinary calcium balance in patients with spinal cord injuries. According to the study by Huston et al. (2001), 53% of respondents with spinal cord injuries reported improved bladder function. 2, 5, 7

1.7. Improvement of the intestinal function

Basics:

In addition to processing our food (digestion), our intestines have a wide variety of vital functions. Energy supply, metabolic exchange, excretion and detoxification as well as immune defence. It is therefore one of the main tasks for our health. It accomplishes this through the immense surface area of the inner intestinal mucous membranes (22m²). Our skin has just 2m² and our lung alveoli 80m². The intestinal flora settled on the intestinal mucous membranes amounts to approx. 10¹⁴, i.e. 100 trillion microorganisms. The immune defence function consists mainly of the fact that pathogens (bacteria, viruses, fungi, parasites) ingested through the mouth and nose are rendered harmless by the intestinal flora and excreted (approx. 1/3 of the stool consists of rejected pathogens) [Source: Dr. med. Iva Tauer-Reich: *Der Darm - seine Funktionen und Einflüsse auf die Gesunderhaltung*]. For this to work, it is important that these endogenous microorganisms are present in a healthy ratio so that the stool can be quickly eliminated from the body.

The challenge for wheelchair users:

Many wheelchair users have to take medication such as antibiotics, corticoids (cortisone) or similar because of their underlying or secondary diseases, but also because of complications. These medicines often have the side effect of damaging the intestinal flora and thus the immune defence function of our intestines also suffers. Nevertheless, the intestine still manages not to suffer any permanent damage because the pathogens are quickly transported further with the stool. Here, however, we now come to the main problem for wheelchair users. The onward transport of the food pulp and digestive waste occurs through muscle movements of the intestinal wall muscles (intestinal peristalsis). However, this is again dependent on the verticalisation of our body and is supported by skeletal muscle activity.

Sitting for long periods inhibits intestinal peristalsis and the stool remains in the intestinal tract for too long. As a result, even more fluid is withdrawn and pathogens in the stool have the opportunity to damage the intestinal flora, but also the intestinal mucosa itself.

By verticalising the body, gravity acts on the intestinal system and thus helps to transport the stool further. Intermittent standing, i.e. alternating between standing, sitting and lying down, additionally stimulates intestinal peristalsis, which consciously promotes both the recovery of the intestinal flora and the removal of stool.

Testimonial:

"Of course, no one likes to talk about their bowel health or their laxative behaviour. However, as a cross-section, you get used to it as it is a very important topic! Through my therapeutic standing training in a wheelchair, I have managed that this topic is no longer an issue for me and I have been able to reduce the use of prescription laxatives to 0"

Andreas 59, orthopaedic specialist. Multiple sclerosis, wheelchair-bound for 15 years

FACTS

Respondents who stood for 30 minutes or more per day had significantly better quality of life, fewer pressure sores, fewer bladder infections, better regularity of bowel movements and better ability to stretch their legs compared to those who stood for less time. Perceived benefits included improvements in several health-related areas such as well-being, circulation, skin integrity, reflex activity, bowel and bladder function, digestion, sleep, pain and fatigue. 1, 2, 5, 7, 8

2. Psychosocial advantages

When we talk about the psychosocial benefits of standing, everyone immediately thinks of participation, integration, inclusion and associates this mainly with the social benefits. However, this is only partially correct, because the psychological component is often ignored, at least mentally.

The ICF of the WHO (International Classification of Functioning, Disability and Health, the current classification scheme of the World Health Organisation) clearly describes the psychological and social factors and their effects on our health. A person's mental/mental health is a health issue and at least as relevant from a health economic perspective as physical symptomatology. Especially because psychosocial problems often manifest themselves in physical symptoms, for which we now even have a separate medical speciality, psychosomatics.

This is not very tangible for most people and is not taken seriously. Unfortunately, the consequence of this is that it triggers further far-reaching psychological problems for those affected.

One could fill entire books with this chapter alone. However, I have tried to find two easy-to-understand examples that can be used to understand the psychosocial benefits and adapt them to other examples.

As already described in the preface, "modern man" has developed over the last 30,000 years to where we are today. However, the physical development as a standing human being is probably much older. Purely mentally and cognitively, we have developed exponentially in the last decades. Purely physically, however, hardly at all, as this blueprint of our body is a real "success model" and has made our cognitive further development possible in the first place.

Why is this so important? Because the involuntary functions of our body in particular are still closely linked to this blueprint from 300,000 years ago.

Let's take various pressoreceptors in our musculature: switching points in our musculature that cause a neurochemical, reflexive and/or hormonal reaction of our body through stretching or contraction stimuli.

Activating our facial mimic muscles for more than 30 seconds triggers the release of endorphins and our mood rises. In addition, mirror receptors are activated in other people and they also smile - laughter is contagious.

When we feel bad, we make ourselves round and small. Conversely, we feel bad (at least after a while) when we are forced to make ourselves round and small.

If we are brimming with self-confidence, we are upright, we show backbone, we walk with a proud chest. Again, the mechanism works the other way around. If we don't feel good and we actively adopt a proud posture, our body reacts to it and we start to feel better.

Our language knows all these mechanisms and we use them constantly, as I wanted to show with the small examples. The language suggests that we trigger physical mechanisms with it. However, we have often forgotten to consciously implement it on a physical level.

What we feel and how we react to it (admiration, flight, submission, attack, etc.) depends on contextual factors of our other sense organs and experiences. It is important to know that we cannot turn off these receptor circuits. We can learn to live with them and train our bodily responses to them, but this requires developing an awareness of these unconscious bodily reactions. Leadership/management training often works and plays with this knowledge, because in the opposite case, when we look down on something, other receptors in the neck muscles signal superiority, majesty, power.

Putting this into the context of wheelchair users, it illustrates quite impressively the mental state these people are in when they have to look up to other people all the time and when others look down on them. Especially if you take a closer look at their personal health situation. Accident, paraplegia, progressive neurological disease, progressive degenerative disease.... these are all events that completely and intensively change the entire life plan of those affected and thus present them with great psychosocial challenges.

Let us now turn to another psychosocial component, disability compensation to meet basic needs. In this area, it is difficult to define a person's basic needs, as these can be very different for each individual. In some examples, it can be very difficult to grasp these basic needs and accept them as such. However, with other examples, it should be indisputable in our society and with our cultural background.

Example.

A 36-year-old mother of two primary school-age children 6 + 8 years. The woman has multiple sclerosis and has been completely wheelchair dependent for 3 years due to severe motor limitations in both legs. She is barely able to stand and walk adequately. She has marked motor weakness in both arms with moderate coordination. She is still able to operate an electric wheelchair with her right hand and to manage most daily tasks with her hands. However, driving a manual wheelchair is no longer possible. The wife lives in an intact marriage, the husband works full time. The wife takes care of the family and the household (as far as she can). What can be defined as basic needs for this woman and how can these be managed with the provision of an assistive device?

- ✓ Accompanying their school children on the way to school (2.5 km).
Did you know that most primary schools prohibit children from cycling to school on their own until they have obtained their "cycling licence" (usually 4th grade)?
 - Standard power wheelchair with supportive seating system and electric tilt, as there is also a slope on the way to school and the woman could fall out of the wheelchair due to low seating stability on this stretch.

- ✓ To withdraw cash from the ATM in order to have an ice cream with the children at the ice cream parlour in the afternoon. To be able to operate the ATM, the woman must be able to stand and/or the wheelchair must have a seat lift so that one can see the control panel.
 - The wheelchair's standing function should already be indicated from a purely medical point of view, but it also plays a psychosocial role here. Since her circulation is always a little unstable in the morning, she often cannot stand without feeling dizzy. For this reason, the wheelchair should also have a seat lift function.

- ✓ Tidying up the flat, vacuuming, preparing lunch, doing the laundry. These are basic needs that most people would gladly do without in everyday life. However, it must be noted that many people with disabilities attach great importance to still being able to do these things independently (although they might even be entitled to domestic help). They feel that these tasks increase their self-esteem and thus often define their role in society as a "full-fledged" mother and wife (not imposed on them, but chosen by themselves).
 - In order to be able to address these basic needs, one naturally needs an insight into the family's living conditions. On the other hand, it should be clear to everyone that not all rooms in a home or family flat can be wheelchair accessible. A utility room is rarely designed to be accessed by a standard electric wheelchair in order to fill the washing machine or tumble dryer. Nevertheless, there are wheelchairs that are better suited for moving around in confined living conditions. Here, medium-wheel-drive wheelchairs are the means of choice. For preparing meals, dusting etc. you need a wheelchair that gives you access to different levels (lift function, standing function) of course always with regard to the medical, therapeutic advantages of these positions. Finally, one must bear in mind that all this is strenuous, especially for already weakened persons. For this reason, the wheelchair must offer the possibility to adopt resting positions (full reclining position, edge position, back and leg support adjustments), because each transfer means an additional effort and especially in MS it is important that any overexertion is avoided, as this could cause a permanent deterioration of the disease.

Facts:

Standing in standing devices has positive psychosocial effects on the user. As professionals, we should broaden our view of the use of standing devices, i.e. consider the standing device as an aid that not only treats the body structures or improves the user's abilities in activities, but also has a psychosocial impact on the user's daily life, and find meaningful goals for the user from a psychosocial perspective. 2, 16, 17

Testimonial:

"Without my electric standing wheelchair with its various functions, I would not be able to manage the many tasks in the household and as a mother, and I would feel useless. It would also be nice if it were a bit faster, as my children constantly complain that I crawl like a snail when we are out together with bicycles and wheelchair. "

Nadja 36, wife and mother, MS

3. Health Economics

In a time of resource scarcity, inflation, demographic change and much more, we have a duty to think and act economically. However, it is important that we start to do this holistically and look beyond our own area of responsibility. There is little point in acting economically in one's own area if this results in many times the costs in other areas.

The efficiency requirement of § 12 SGB V clearly states that medical aids must be economical and must not exceed what is necessary. However, it is important that we act holistically when considering economic efficiency and the degree of necessity. This means that the acquisition costs for a standing wheelchair must be put in relation to the costs (treatment/personnel, medication, hospitalisation and operations, bandages and other disposable materials, etc.) that arise due to complications, secondary diseases (of the wheelchair obligation and the underlying disease). As already proven by studies in the previous chapters, these consequences of the disability or illness can be largely reduced or even prevented by the functionality of a standing wheelchair.

It does not help anyone and, above all, it does not save any costs if aids are refused for economic reasons, but this results in significantly higher costs in other medical areas and causes pain, suffering and secondary illnesses for those affected.

Comprehensive studies or scientific publications that include all health economic facts do not yet exist. This makes it difficult to measure the cost-effectiveness of a stand-up wheelchair in terms of all contextual factors. In principle, however, it should be clear that if all studies from the individual chapters are taken into consideration (from a health economic point of view), a stand-up wheelchair must be considered the most economical solution in many cases.

Multifunctional wheelchairs for standing are one of the few categories of aids where all three points are equally important and therefore their usefulness can be justified to an even greater extent than with other aids.

1.
 - a. Patients affected by craniocerebral trauma can be mobilised again through functional standing training in a standing wheelchair to the extent that independent standing and even functional walking is possible again.
 - b. Patients who need to be ventilated can remain independent of mechanical ventilation for longer due to better lung ventilation, deepening of breathing and activation of the respiratory support muscles.
 - c. By activating closed kinetic muscle chains, therapeutic goals (for different diseases) can be supported and consolidated.

2.
 - a. Prevention of pressure injuries by changing position and complete pressure relief of sensitive regions by complete pressure relief in standing position
 - b. Prevention of contractures and reduction of spasticity, especially of the lower limb, by stretching the joints concerned and weight bearing without joint dynamics.
 - c. Prevention of bone demineralisation, by loading against gravity and thus preventing fractures.
 - d. Prevention of lung infections due to inadequate lung ventilation
 - e. Prevention of thrombosis and lymphoedema due to draining positioning and activation of the "muscle/venous pump".

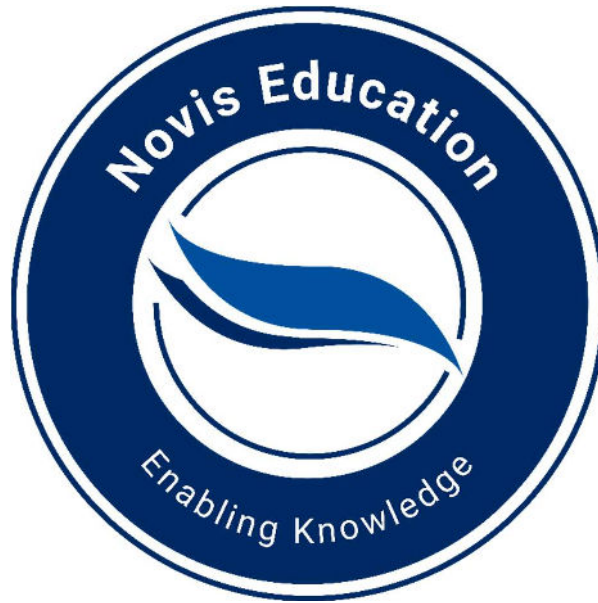
3. The restoration of mobility lost or restricted due to illness or disability and participation in the community, but not in the sense of the almost unlimited possibilities of a non-disabled person. Aids in this sense serve the self-determined lifestyle and mobility in the domestic environment as well as the fulfilment of basic needs such as reaching medical and therapeutic facilities, shops to purchase things for daily needs as well as social facilities that are of individual importance for the person concerned (cemetery, family, social facilities).

Evaluating and taking into account all these health economic aspects requires enormous foresight and specialised expertise from all involved. Especially because no scientific discipline has yet addressed this issue with comprehensive studies.

Complex assistive devices, such as multifunctional standing wheelchairs, require interdisciplinary consideration of individual cases and specialisation on the part of the providers. This is the objective of this brochure. To support specialists and to provide decision-making and argumentation support for interdisciplinary teams of prescribers and funders.

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