



Patient Education

Movement and Exercise

A guide for you after spinal cord injury

Spinal Cord Injury
Rehabilitation Program

This booklet has been written by the health care providers who provide care to people who have a spinal cord injury or illness. At the time of this printing the information was accurate to the best of our knowledge. The information may change due to the rapid changes in health care. It is not intended to replace medical/health advice from your health care providers.

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Movement

After a spinal cord injury you will have to learn new ways to move. You may need to learn how to balance, sit, roll, lie down, sit up, lift your body, stretch your legs or move your legs in and out of bed or your wheelchair. Since it is easier to move on the firm surface of a mat, you will practice on a mat before trying these skills out in bed. You and your physiotherapist will work together on learning these skills. Not everyone will have the strength and balance to learn all of these skills.

As physiotherapists working with you we suggest you take a S.M.A.R.T. approach to movement.*

S	stretch before, during and after activity
M	move today for tomorrow
A	add it up, an hour is power
R	reduce strain, use tools that work for you
T	talk with your physiotherapist

Balance

Balance is needed to do things without holding on. While you are in the hospital you will learn to balance while:

- sitting in bed
- sitting on a floor mat or raised platform (plinth)

* S.M.A.R.T. approach to movement © Canadian Physiotherapy Association

- sitting on the edge of a bed
- sitting in your chair
- standing if you have any muscle power in your legs
- standing in a tilt table or standing frame

You may also need to learn how to balance on your hands and knees if you have muscle power in your legs.

Standing

Key benefits of standing

Here are some benefits of standing:

- Prevention or reversal of osteoporosis. Osteoporosis is when your bones become thinner and weaker causing them to break more easily.
- Prevention of contractures and improvement of joint range of motion. Contractures are a tightening of muscles, tendons, ligaments or skin that prevents normal movement.
- Reduction of spasticity.
- Improvement in how well your kidneys work and how well your urine leaves your body. It also helps to prevent kidney stones.
- Prevention of pressure ulcers.
- Improvement in circulation to decrease the risks of orthostatic hypotension. Orthostatic hypotension is a decrease in your blood pressure when you stand or change position. It can cause light headedness or fainting.
- Helps to prevent constipation.

Many patients have told us of these benefits. However, they have not been proven scientifically.

After being in bed for a long time, your body needs to get used to being upright again. This takes time for your body to adapt. You will start by standing on the tilt table at a low angle. You will gradually increase the angle putting you more upright.

Your blood pressure and heart rate are checked to make sure you are okay while standing on the tilt table.



Standing on a tilt table

When you can stand up on the tilt table, you will then be ready to try standing from your wheelchair in a standing frame. There are several different types of standing frames which can be tried. There are also special wheelchairs which allow you to stand up.

After standing in a standing frame and learning balance you may then progress to the parallel bars to try walking using braces. Some persons may not be able to try this.



Standing in a standing frame

Walking

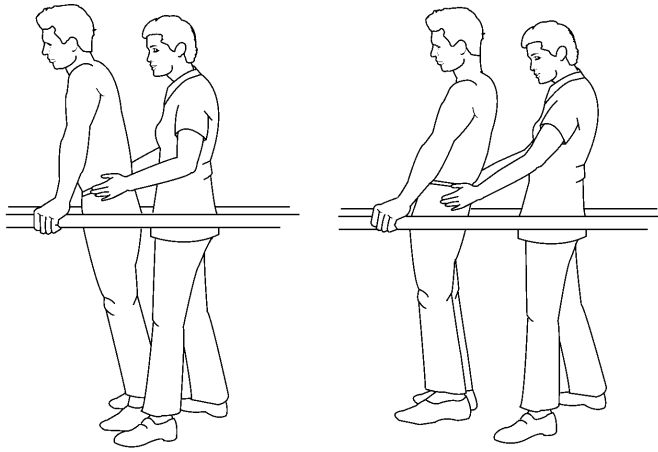
If you are a paraplegic at level T8-L4 and you choose to stand or walk you may need special braces and walking aids.

This method of walking is very hard work and you might decide not to walk on braces. The energy you use to wheel a chair is only half of that needed for normal walking. The energy that you use to walk on braces and crutches is ten times that of normal walking.

If your injury is not complete, you may be able to walk with some bracing. To learn to walk on braces and crutches you have to learn all of these skills:

1. Putting the braces on and off.
2. Checking your skin.
3. Balancing in standing.
4. Getting up to standing from sitting in a chair. Sitting back down.
5. Walking.
6. Turning.
7. Climbing stairs, walking on slopes, rough ground and opening and closing doors.
8. Falling without hurting yourself.
9. Getting down to the floor and back up from the floor.
10. Getting into and out of a car.
11. Any other activity that you may choose to accomplish with your braces.

All of these skills are first learned in the parallel bars and then on crutches.



Walking in Parallel Bars

The therapists working with you will help you to decide on the right bracing for you depending upon your needs. The amount of bracing will depend on the level of injury. Braces do not work for everyone. The more muscle power that you have the less bracing will be needed.

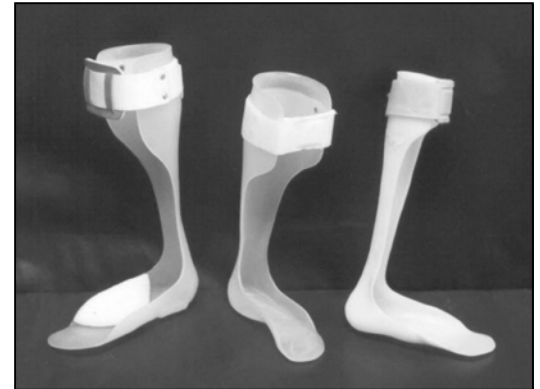
Trial braces are available. If you and your physiotherapist decide you need bracing a prescription will be written for you. Bracing can be expensive. Speak with your physiotherapist and social worker about programs to help with payment.

Braces

Braces are called orthoses. They are made by an Orthotist. They are made from various materials. The type of brace that will work best for you will be assessed and proper ones will be fitted to you.

Drop Foot Brace

These braces are called "shoehorn braces". They are made of light plastic and fit inside your shoe to keep toes from dragging when you walk. A stronger brace will keep your ankle from rolling over on either side. This type of brace can also be used as a resting splint for ankle positioning.

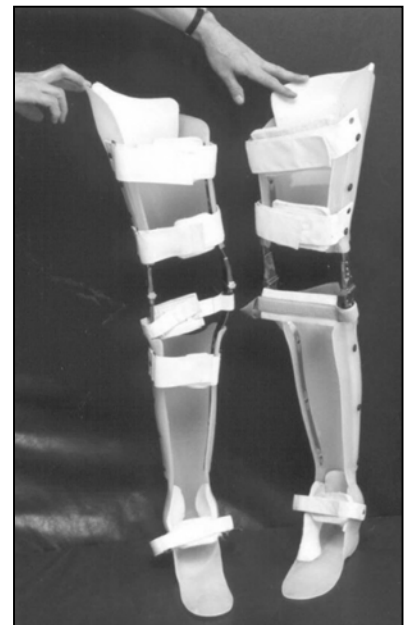


Ankle Foot Orthosis (AFO)
or Shoehorn Brace

Full Leg Braces

Some people with spinal cord injury are able to use full leg braces for walking. These leg braces are made of metal and plastic and have locks at the knee joints. The braces are fitted for your needs and are worn underneath the pants.

If you are a paraplegic at level T8-L2, you may choose to walk on full leg braces and crutches. These braces are a combination of plastic and metal uprights that will support your knees, ankles and feet in a fixed position for you to stand.



Knee Ankle Foot Orthosis (KAFO)
or Full Leg Brace

You will be shown and may have the opportunity to try different braces before you make the decision to have these made for you. Your doctor or physiotherapist will be able to tell you more about walking with braces.

Exercising to keep strong and fit

If you use a wheelchair all or part of the time, one of the biggest mistakes you may make is to find yourself too busy to take the time to exercise. Without regular exercise your body will become weak, will tire easily, and the risk of injury will be higher.

If you keep your muscles strong and your heart and lungs fit, you will be able to do more and do it for a longer time. How strong you can get will depend on your age, the level of spinal cord injury and how hard you are willing to work. If your injury is low in the spinal cord, you will have many muscles working that you can strengthen. If your injury is above T2, you may have only arm muscles to work on.

There are two types of exercises you should do:

- building your strength or weight lifting
- fitness or making your heart and lungs stronger.

Building your strength or weightlifting

To become stronger you must work harder during normal daily activities and you must work for longer periods as you improve.

Warm-up – Before starting strength exercise:

1. Stretch your joints and muscles for 5 to 10 minutes to prevent tearing muscles during exercise.
2. Work with no weights for 2 minutes. Now you are ready to start to exercise. Your physiotherapist will teach you which exercises to do.

Exercise should be done as a regular routine or number of sets. Do each exercise 10 times, at a weight that is hard to lift the last 2 times. Ten lifts is one set. You should do 3 sets for each exercise, 30 in all, with a rest period between each set.

If one set takes 5 minutes to do, you should rest 5 minutes before starting the next set. As you get stronger, you can cut the rest time to half or one quarter of the exercise time. If one set takes you 5 minutes, you should rest for 1½ to 2½ minutes.

If your muscles are very sore after your first workout, you may have started with too much weight. As you get stronger, add more weight each week, but do not increase the total number of exercises beyond 40 or 50 or 4 to 5 sets. Remember to rest between sets.

Key points to remember about exercise:

- You should work out for 30 to 60 minutes only 3 or 4 times each week as your muscles need time to recover between each workout.
- You will not get stronger if you work out less than 3 times each week.
- Hard exercise done only once in a while may injure your body.
- After exercising, you should always stretch again. This is called a "cool down" and keeps your muscles from feeling too sore the next day.

Fitness

The second type of exercise is to make your heart and lungs stronger so you will not get tired and will have good "staying power" when you work, play or wheel. The easiest way to get fit is to wheel for long distances, but you can also use an arm crank machine.

Warm-up – Before starting fitness exercises:

1. Stretch your joints and muscles for 5 to 10 minutes to prevent tearing muscles during exercise.
2. Wheel or crank easily for the first 2 minutes. If you can only do one of these, the warm-up wheel is more important than the stretch.

Start your first session at an easy pace for 15 minutes. Over a period of a few weeks, increase first your distance and then your speed until you can wheel ½ to 1 hour. You can make the work harder by wheeling over rough or hilly ground.

Another way to get fit is to turn an arm crank against resistance. Your physiotherapist will show this to you. Start with an easy warm-up, increase the resistance and crank for 5 minutes. Increase the work by increasing the resistance, the time or the speed until you are cranking 30 minutes. Remember to cool-down with 2 minutes of easy cranking or wheeling at the end of your exercise session. If you are still sore after 48 hours you may have progressed too fast.

Swimming is also a good way to increase strength and power and is easy on your skin. But - never swim alone! There are usually public pools in most communities with wheelchair access.

Healthy exercise hints:

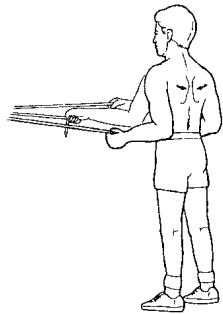
- Never exercise on a full stomach. Wait 2 hours after a big meal.
- Drink plenty of water to replace the water your body loses when you sweat. Please talk with your doctor or nurse about how much fluid you should drink.
- Wear comfortable clothes and dress for the weather.
- If exercise causes a lot of pain, see your doctor.

Make exercise a part of your lifestyle. Staying healthy and fit includes:

- keeping your joints flexible
- eating well and staying at an ideal weight
- keeping your muscles strong
- keeping your energy level high
- keeping in regular contact with your doctor to prevent problems
- doing activities that you enjoy for fun

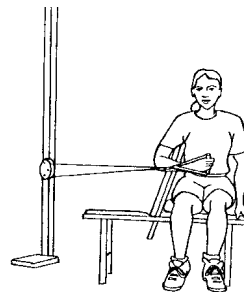
Protecting your shoulders

If you use a wheelchair or walk with canes or crutches, your arms are doing all or part of the work you used to do with your legs. This puts severe strain on your shoulders. There are 3 exercises you should do on a regular basis to prevent injury to your shoulders. These are shown below using a theraband. Tie the theraband to a solid object for all 3 exercises. Do 3 sets of each exercise once a day.



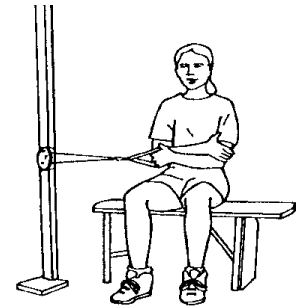
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1. Hold the band in both hands as shown. Pinch shoulder blades together as you bend elbows and pull elbows straight back. Hold 5 seconds and slowly relax. Repeat.



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2. Sit with arm at side. Bend elbow, rotate forearm inward toward body. Hold 5 seconds and slowly relax. Repeat.



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3. Sit with arms across the body or at side. Bend elbow. Rotate forearm outward away from body. Hold 5 seconds and slowly relax. Repeat.

If you do not have a good finger and hand control you can do all of these exercises using a wrist cuff.

Protect your skin while sitting

It is up to you to always protect your skin. When you sit or lie on an area of your body where your muscles don't work, the weight of your body flattens out your tissues and blood vessels. When the blood vessels are flat, no blood can run through them to keep your skin alive. If blood does not reach your skin over a period of time the skin will start to die and a pressure sore will form. Please see the booklet on **Keeping your skin healthy**.

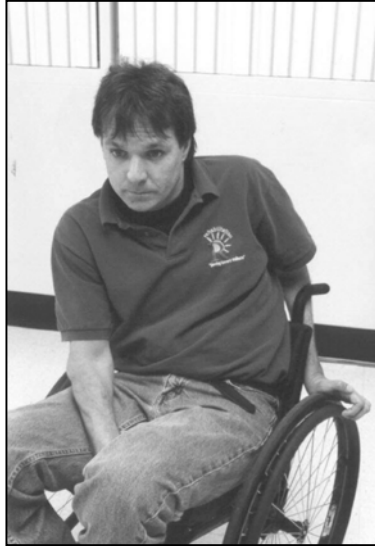
You can prevent pressure sores by sitting in a good position and by lifting or shifting your body weight for 30 seconds every 15 minutes.

Guidelines for good sitting posture

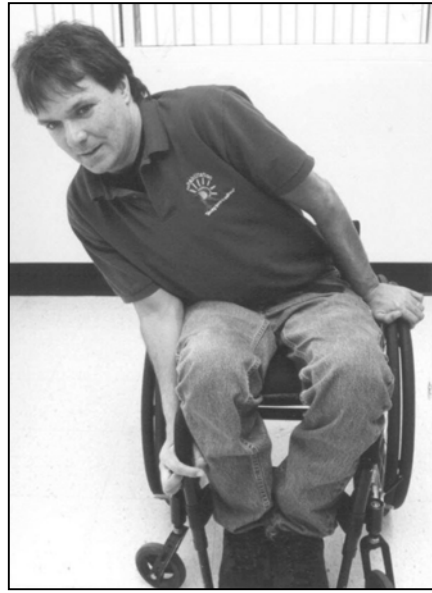
- Keep your body in a straight position that is comfortable and safe.
- When you sit in your wheelchair, keep your back straight, don't lean to the side, hunch your shoulders or let your chin poke forward. Your hips, knees and ankles should be placed so that you do not fall forward or slide out of the wheelchair. Your knees should not rub together or against a metal part of the chair.
- Support your arms if they are very weak.
- Use a special chair cushion that has been prescribed for you to protect your skin from pressure.
- If you have spasms in your arms or legs, move your arms or legs in the opposite position from where the spasms pull you.

How to shift or lift your body weight

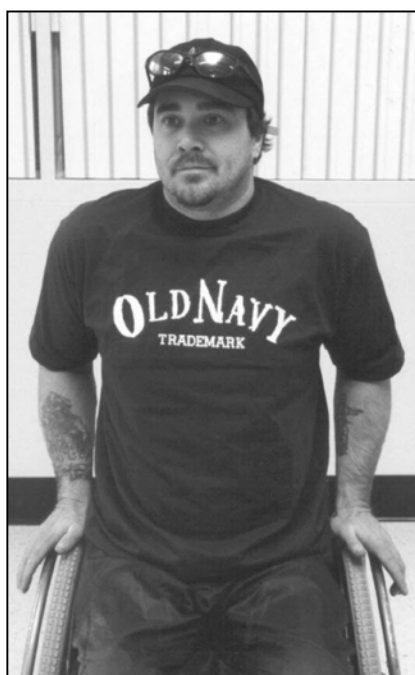
These pictures show you how to lift your weight for your level of injury. Remember to check all of your skin with a mirror every day for red spots. Your nurse or occupational therapist will provide a mirror. You want to be sure you are shifting your weight often enough to prevent red spots from appearing.



C5 Level Injury – Shift weight by leaning to each side.



C6 Level Injury – Locked elbow lift. No triceps control.



C7 Level Injury - Elbow lift with body balanced – no finger control.



T5 Level and Below - Normal lift with full arm and hand control.

Basic wheelchair skills

If you are tetraplegic, you will need to learn the special skills needed to handle your wheelchair. These are:

- Unlocking and locking the brakes.
- Unlocking and moving the armrest.
- Picking up objects from the floor.
- Moving the footplates to the side.
- Moving your hips forward in the chair.
- Pushing the chair straight and turning on the level.
- Pushing the chair on a slope.
- Going up or down a two inch curb.
- Directing someone to take you, in your wheelchair, up and down stairs.

Unlocking and locking the brakes



Lock – Using the heel of the hand.



Unlock – Step 1



Unlock – Step 2

Unlocking and moving the armrest

Follow these 2 steps.



Step 1 – Push the armrest lock forward with the heel of your hand.



Step 2 – Lift up the armrest.

Picking up objects from the floor

Position the chair sideways on to the object. Hook the right elbow behind the right chair handle and lean over the left armrest. To avoid too much pressure on the rib cage, hold this position for only a few seconds at a time. If your wrist extensor is strong, hook your wrist against the push handle. This gives you a longer reach. To get back upright, pull up with your right elbow.

Moving the footplates out to the side

Back up the wheelchair until the front wheels turn all the way to the front. Lock your brakes. To keep your balance lean forward with your elbow on the armrest or hooked around the push handle.



Hook your wrist behind your ankle or knee and push or lift your leg off the footplate.



Unlock the footrest release button with the side of your hand and push the footrest to swing it out to the side.

To swing the footrest back into place, put both feet on one footrest or out to the side. Hook your wrist behind the other footplate and push it around to the front. It will lock into place on its own. Hook your wrist behind your heel and lift your foot back onto the footrest.

To get back upright, throw your stronger arm back over the back rest or hook your hand behind the push handle. Pull your body upright by pulling with your wrist. If you have tricep control, hook both wrists under the armrests or edge of the wheels and pull yourself upright.

Moving your hips forward in the chair

Option 1 - Lock the chair. Put both hands on the wheels with your hands turned back and your elbows locked. Throw your head back and push down through your arms to lift your body and your hips will slide forward.

Option 2



Put your right arm well forward on the armrest or leg rest and lean to the side over it. Put your left palm on the armrest with your hand turned back and your elbow locked, push down to lift your body up. At the same time, throw your head back and wriggle your left hip forward.

Pushing the chair on the level

To wheel forward, place your palms on the highest part of the push rim and push forward and down. To back up, place your palms a little toward the back of the push rim. Lock your elbows and push back and down strongly.

Your arms can be either over the back rest between the push handles or outside the push handles. If you are unable to push up a slope going forward, use this method to push up backwards.

Pushing up a slope

Lean forward so your chair does not tip over backwards. The steeper the slope, the farther forward you must lean. Push as on the level in this forward position. If you have to stop to rest part way up the slope, turn the chair to the side and put the brakes on. To restart push across the slope and gradually turn upwards again. Remember to lean forward so your chair does not tip over backwards.

Going down a slope

Lean back in the chair and slow the wheels down by partial braking, by holding your tires, or by pressing the heel of your hand, your gloves (or the inside of your forearms if you are wearing long sleeves) against the push rim.

Turning the wheelchair

Place your left hand behind the push handle and push down on the wheel while holding on to the right wheel OR push forward and down on the right tire. The chair will turn left. If you can do both together, the chair will turn faster and further.

If you are moving, grab or push down on one wheel and the chair will turn in that direction.

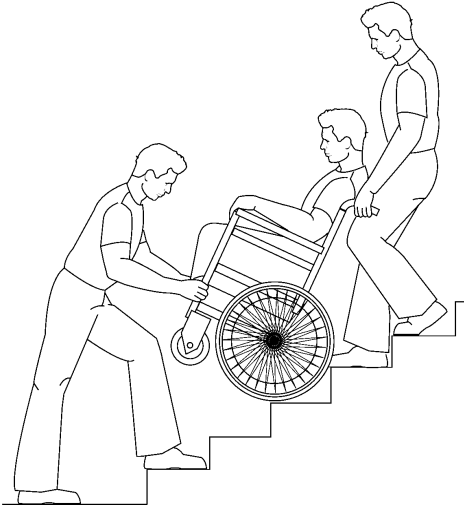


Going up a 2 inch step

Follow these 4 steps:

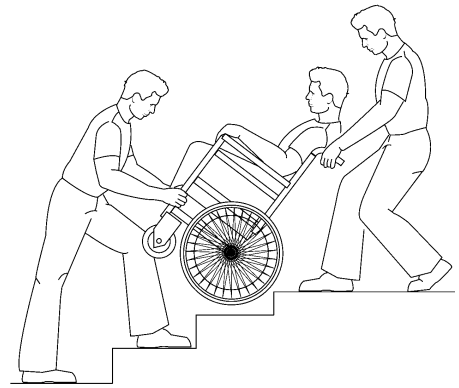
1. Place your palms on the top, outer edge of the tire. Your fingers should be down over the rim and your thumb between the rim and the tire.
2. Just before the footplates touch the curb, push forward briskly. This will flip the front wheels up onto the curb.
3. Immediately bend your head and shoulders forward to push the front wheels down onto the step.
4. Keep your head forward and quickly push forward on the push rims to bring the rear wheels up onto the steps.

Going up stairs in your chair with help

- Remove the anti-tip bars. Roll the chair backwards until the wheels touch the first stair.
 - The helper behind tilts the chair back. He then stands on the second and third steps above the chair, not on the step you are moving to.
 - A second helper removes the leg rests (if they come off) and grips the frame of the chair. If the leg rests do not come off, the helper can grip on the leg rests. The legs of the person in the chair will hang free.
 - On a count of 3, the first helper pulls up and back (**being careful to lift with your legs, not your back**), the second helper pushes forward and up to roll the chair over the rim of the stair.
 - At no time do they lift the chair clear of the step.
 - As the first helper will do most of the work he/she should be the stronger and should do the counting.
- 
- If you have strength in your arms, you can do much of the work yourself by gripping the wheels and pulling back strongly on the count of three. When you reach the top, back away from the stairs, turn the chair and then lower it onto four wheels. The helper should be sure to wear non-skid footwear.

Going down stairs in your chair with help

- Remove the anti-tip bars and leg rests (if they come off).
- Helper in front stands with feet 2 stairs below the chair.
- This person will guide the chair and slow it down.
- The helper behind tilts the chair and lowers it on the count of 3.
- Count for each step and be sure everyone is ready before starting down the next step.



If you are paraplegic you will help slow the chair down by letting the wheels slide through your hands. The helpers should be sure to wear non-skid footwear.

Advanced wheelchair skills

Please refer to the preceding section for directions for all basic wheelchair skills. Paraplegics and some tetraplegics also learn these advanced skills:

- wheelies
- going up and down a curb
- jump shifts
- car transfer
- getting from the chair to the floor
- getting from the floor to the chair

* The methods described here are a guide. You may devise your own slightly different methods over time. However, these skills and techniques need to be practiced to be perfected.

Wheelies or balancing the chair on the rear wheels



Lean into the back rest, grasp the rims toward the back and pull briskly forward. This will lift the front wheels. Hold the rims in the middle and play them gently to maintain balance.

Going up a curb

Follow these steps when going up a curb:

1. Approach the curb at an easy speed.
2. Just before the footplates touch the curb flip the front wheels onto the curb.
3. Immediately lean forward; this will push the front wheels down.
4. Lean your body weight forward over the front wheels as you reach back on the rims and pull the rear wheels forward to move the rear wheels onto the curb.

Going down a curb

There are 2 ways to go down a curb:

Number 1

- Turn backwards to the edge of the curb.
- Lean well forward and push the chair backward toward the curb until the rear wheels drop off.
- Continue to lean forward and let the chair roll free until the front wheels drop off and the footplates clear the curb.

If you do not lean forward the chair may tip over backward.

Number 2

- Approach the curb going forward.
- Just before you reach the edge do a wheelie and move the chair forward in the wheelie position until you feel the edge of the curb under your rear tires.
- Lean slightly backward and continue to wheel off the curb holding the wheelie. The front wheels should not come down until the back wheels are on the ground.

Do not use this second method until you are expert at wheelies.

Jump-shifting the chair sideways

This shift is used to make a turn into a doorway where the hall is too narrow to wheel around the corner.

1. Wheel forward until your footrests are even with the far edge of the door you wish to go through.
2. Put both brakes on.
3. Lean forward, grip the wheel rims or wheels at the top and jerk the chair up and toward the doorway.
4. Continue the shifts until the footplates are far enough into the doorway to let you wheel through.

Car transfer

There are many ways to put your wheelchair in the car depending on your strength, level of injury, the type of car and whether you have a folding or a rigid frame wheelchair.

Examples:

Folding frame wheelchair into a 2-door care back seat

1. Open the car door wide.
2. Position your chair at an angle as close to the car as possible and lock the brakes.
3. Remove the armrest and leg rests and set them on the back seat of the car.
4. You can either put your feet in first or leave them on the ground.
5. Transfer across into the car. You may need to use a sliding board and it may be helpful to have the window rolled down.
6. Lift your feet into the car.

7. Put the cushion into the car. Pull up under the centre of the seat to fold the chair. Lift the front wheels into the back seat of the car.
8. Move to the centre of the seat, move the seat as far forward as you can.
9. Push the back of the car seat forward and reach behind it to grab the front of your wheelchair and pull it into the car.
10. If you can't reach the car door, close it with a rope tied to a firm part of the door.

Rigid frame wheelchair

1. Open the car door wide.
2. Position your chair at an angle as close to the car as possible and lock the brakes.
3. Remove the arm rests and put them in the car.
4. Transfer into the car as described for the folding frame wheelchair.
5. Put the cushion in the car.
6. Release the rear wheels one at a time and lift them into the back of the car. Pick up the wheelchair frame and lift it over yourself to set it on the passenger seat.

Reverse the steps to get the wheelchair out of the car. Be careful to put the brakes on before you let go of the wheelchair so it doesn't roll away from you.

Getting from your chair to the floor

Two methods are described to move from your chair to the floor. Practice these options in physiotherapy before choosing one yourself.

Option One

Take your shoes off if the soles of your shoes grip the floor and stop your feet from sliding. Lift with your elbow on the chair back and your right hand on the wheel, and pull the cushion out with your left hand.

Step 1 - Remove or swing away the leg rests and place the cushion between the front wheels to protect your skin from the floor.

Step 2 - Grip the front of the seat and lift your hips to slide forward over the edge of the seat.



Step 3

Gradually lower your weight to the floor. If you have no stomach muscles, you will have to arch your head and shoulders backwards to tip your hips forward off the chair. Keep on arching to prevent pitching forward while you lower your body to the floor.



Option Two

Step 1 - Remove one arm rest and swing away the leg rests. Place your legs out straight and shift your hips forward into the front corner of the chair on the side where you removed the arm rest. You are now sitting at an angle.



Step 2 - Hold onto the chair seat with one hand and slide the other hand down your leg to the floor and walk your fingers out to the side.



Step 3 - Lift your body forward and down in one quick, smooth movement. Set your hips down gently.



Getting up from the floor

Three methods are described to get up from the floor. Put your shoes on as the friction of shoes on the floor will help you push up into the chair.

Option One - Steps 1 to 4



Step 1



Step 2

Step 1 - Sit at an angle to the chair. Bend your knees up, grasp the corner of the chair closest to you with one hand and place the other hand on the floor.

Step 2 - Lean forward over your knees. Push upward quickly and strongly to hike your hips into the air and onto the seat.



Step 3

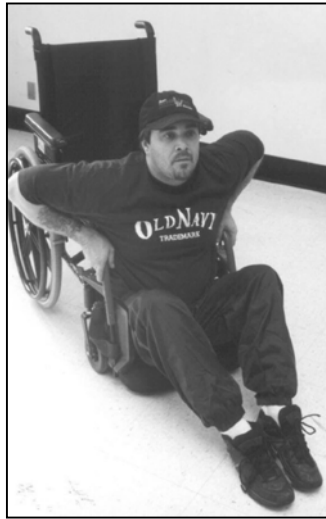


Step 4

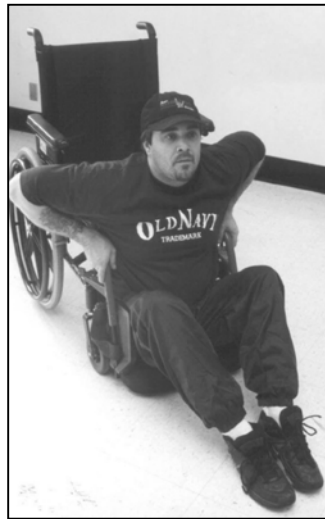
Step 3 - Your head will be down near your knees through-out the lift.

Step 4 - Walk the hand on the floor up your leg to your chair. Sit upright.

Option Two - Steps 1 to 5



Step 1



Step 2(a)



Step 2(b)

Step 1 - Turn the front wheels of the wheelchair to the front, remove one leg rest and flip up the footplate of the other. If there is enough room to sit between the footplates you do not need to remove a footplate. Place your cushion between the footplates and sit on it. Bend your knees up, grip the edge of the seat and the top of the leg rest (or both leg rests).

Step 2(a) - Arch your neck and lift quickly and strongly.

Step 2(b) – Once your hips are in the air, bend your head and shoulders forward. This will drive your hips back into the chair. The chair may tip slightly until the footplate hits the floor but will right itself when your hips reach the seat.



Step 3



Step 4



Step 5

Step 3 - Replace the cushion by stuffing it under the corner of one hip, and

Step 4 and 5 - pushing it in as you do three or four quick one-handed lifts.

Option Three - Steps 1 to 6



Step 1



Step 2

Step 1 - Remove the leg support strap and the right arm rest from the wheelchair. Put the brakes on and set your wheelchair on its back. Move to the back of the chair and place the corner of your cushion under the back rest. Sit on the cushion. Lift your legs one at a time and place your feet over the edge of the chair seat. Grab the wheels, lie back and pull your hips into the chair. Push on your knees until your legs are as far over the edge of the seat as they will go.

Step 2 - Place your right hand on the floor outside the push handle beside your shoulder. Grasp the left (or right) side of the seat frame with your left hand. Push strongly to rock the chair an inch or two up off the floor.



Step 3



Step 4



Step 5



Step 6

Step 3, 4 and 5 - Continue to push and walk your right hand forward along the floor to bring the chair back further off the floor. At the same time, push forward on the frame of the seat with your left hand. Your body will be bent over the right side of the chair.

Step 6 - Hold on to the chair as it comes over the top and settles on four wheels. Straighten up your body, take the brakes off and back the chair up carefully (do not push forward) to untangle your feet. Replace your leg strap and arm rest.

Please note some of the newer back rests pop off when attempting this technique.

No matter how you exercise, remember:

Keep yourself S.M.A.R.T.

S	stretch before, during and after activity
M	move today for tomorrow
A	add it up, an hour is power
R	reduce strain, use tools that work for you
T	talk with your physiotherapist

