Queensland Health

Introduction to adjusting and maintaining assistive technology

Medical Aids Subsidy Scheme

28 July 2022

Queensland Government

Learning objectives

Explore common repairs and maintenance requirements

Orientate you to resources from the Medical Aids Subsidy Scheme and other sources about maintaining and adjusting equipment

This session’s focus

- Basic adjustable manual wheelchairs
- Mobile shower commodes
- Wheeled walking aids
- Bathing and toileting aids
- Pressure cushions
- Sling hoists

Session structure

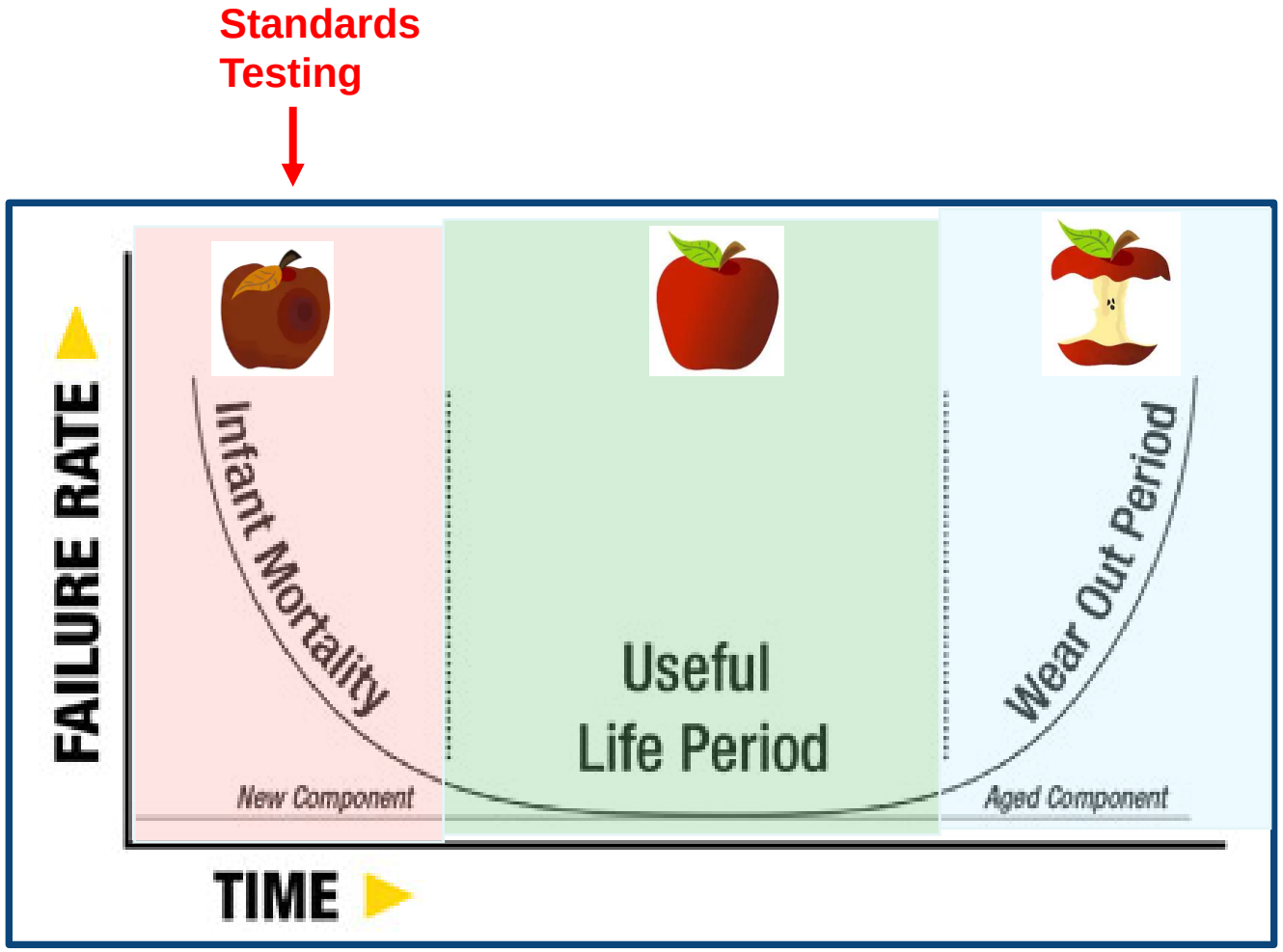
- Evidence-based practice on repairs and maintenance
- Sourcing instructional resources
- Resources for manual wheelchairs, sling hoists, pressure cushions, mobile shower commodes and bath transfer benches
- Maintenance checklists
- Questions and discussions
- Feedback form

How long does equipment last?

Equipment	Median replacement rate (according to equipment suppliers) in years[1]
Wheeled walking aid	5
Manual wheelchair	5
Manual wheelchair tyres / spokes	2-3
Hoist	5-9
Hoist batteries	2
Hoist sling	2.5
Pressure cushions	2.5-3.5
Mobile shower commode	5

1. Marini, I., Vang, C., Antol, D.L., et al. (2019). Redux: Empirical validation of medical equipment replacement schedules in life care plans. *Journal of Life Care Planning, 17*(2), 5-17.

Typical product performance



Wheelchair repair facts

44.8 - 88.3% full-time WC users completed a repair within 6 months[1,4,5,6]

8.7% - 42% full-time WC users had an adverse consequence occur from wheelchair failure[1,4,5,6]

Customisable MWC more likely to require repairs[2]

PWC more likely to require repairs[1,2,3,4,5,7]

TIS more likely to require repairs[2,3]

PWC users more likely to experience adverse consequences[1]

Power seat functions not related to number of repairs[1]

Mixed evidence whether power seat functions related to adverse consequences[1,7]

Relationship between age / use of device and number of repairs is linear[2,4]

Over time in the USA, number of repairs and adverse consequences is increasing[7]

1. McClure, L.A., Boninger, M.L., Oyster, M.L., et al. (2009). Wheelchair repairs, breakdown, and adverse consequences for people with traumatic spinal cord injury. *Archives of Physical Medicine & Rehabilitation, 90*(12), 2034-4.
2. James, A.M., Pramana, G., Schein, R.M., et al. (2022). A descriptive analysis of wheelchair repair registry data. *Assistive Technology,* online early.
3. Mhatre, A., Pearlman, J., Schmeler, M., Krider, B., & Fried, J. (2022). Community-based wheelchair caster failures call for improvements in quality and increased frequency of preventative maintenance. *Spinal Cord, 60*(1), 58-62.
4. Henderson, G.V., Boninger, M.L., Dicianno, B.E., & Worobey, L.A. (2022). Type and frequency of wheelchair repairs and resulting adverse consequences among veteran wheelchair users. *Disability & Rehabilitation: Assistive Technology, 17*(3), 331-337.
5. Worobey, L.A., Heinemann, A.W., Anderson, K.D., et al. (2022). Factors influencing incidence of wheelchair repairs and consequences among individuals with spinal cord injury. *Archives of Physical Medicine & Rehabilitation, 103*(4), 779-789.
6. Toro, M.L., Worobey, L., Boninger, M.L., Cooper, R.A., & Pearlman, J. (2016). Type and frequency of reported wheelchair repairs and related adverse consequences among people with spinal cord injury. *Archives of Physical Medicine & Rehabilitation, 97*(10), 1753-60.
7. Worobey, L., Oyster, M., Nemunatis, G., Cooper, R., & Boninger, M.L. (2012). Increases in wheelchair breakdowns, repairs, and adverse consequences for people with traumatic spinal cord injury. *American Journal of Physical Medicine & Rehabilitation, 91*(6), 463-469.

Common repairs by device[1,2]

Category of device	Most common repairs (more to less frequent per category)
MWC	Wheels / castors / tires / forks General servicing Armrest Legrest / footrests
PWC	Batteries/cables Electronics General servicing Frames
Scooter	Batteries/cables General servicing

1. James, A.M., Pramana, G., Schein, R.M., et al. (2022). A descriptive analysis of wheelchair repair registry data. *Assistive Technology,* online early.
2. Toro, M.L., Worobey, L., Boninger, M.L., Cooper, R.A., & Pearlman, J. (2016). Type and frequency of reported wheelchair repairs and related adverse consequences among people with spinal cord injury. *Archives of Physical Medicine & Rehabilitation, 97*(10), 1753-60.

Consequences of wheelchair breakdowns[1,2]

- Immobility
- Direct injury
- Worse pain, e.g., through increased rolling resistance with castor breakdown
- Poorer self-perceived health
- Higher risk of hospitalisation (odds ratio 2.17, $p<0.10$)
- Higher risk of pressure injuries (odds ratio 1.72, $p<0.05$)

1. Hogaboom, N.S., Worobey, L., Houlihan, B.V., Heinemann, A.W., & Boninger, M.L. (2018). Wheelchair breakdowns are associated with pain, pressure injuries, rehospitalization, and self-perceived health in full-time wheelchair users with spinal cord injury. *Archives of Physical Medicine & Rehabilitation, 99*(10), 1949-1956.
2. Wilson-Jene, J., Mhatre, A., Ott, J., et al. (2021). Rolling resistance of casters increases significantly after two years of simulated use. *Journal of Rehabilitation Assistive Technology Engineering, 8*, 20556683211025149.

How important is maintenance?

Abstract

Objective: To investigate whether active intervention using a compiled checklist for wheelchair check-ups increases user satisfaction and/or decreases accidents, near accidents and pressure sores.

Design: A randomized controlled trial comparing active intervention versus standard intervention for prescribed, manually propelled wheelchairs.

Setting: Patients within primary health care of Bora°s and Bollebygd municipalities, a mixed urban and rural population.

Subjects: Users of manually propelled wheelchairs over 16 years of age.

Interventions: The accident rate, extent of pressure sores, number and extent of repairs, reconditioning, adjustments as well as user satisfaction were measured initially and at one year. In the standard intervention, the user and carer were encouraged to initiate contact when necessary. In the active intervention, an occupational therapist performed a scheduled, thorough check-up of the wheelchair, following a compiled checklist for safety, comfort and positioning, manoeuvrability and transportation.

Results: Of 253 registered wheelchair users, 216 were suitable and randomized. In the active intervention group, 99% (95% confidence interval 96 / 100%) of the inspected wheelchairs required maintenance. The incidence of accidents was unchanged in the standard intervention group, but decreased to 'no accidents' in the active intervention group (p / 0.03). User satisfaction was not affected by the active intervention.

Conclusion: Most wheelchair users are unable to determine on their own when adjustments are needed. An active check-up on manually propelled wheelchairs seems to reduce accidents. More information is available at http://www.wheelchair.se

- RCT manual wheelchair regular inspection (1 x 1hr per year) vs standard reporting
- Reduction in accidents with regular inspection
- Increased number of minor repairs by OT and exchange of parts

Hansen, R., Tresse, S., & Gunnarsson, R.K. (2004). Fewer accidents and better maintenance with active wheelchair check-ups: a randomized controlled clinical trial. *Clinical Rehabilitation, 18*(6), 631-639. doi: 10.1191/0269215504cr777oa

Toolkit

- ❑ Tape measure
- ❑ Socket wrench set
- ❑ Allen / hex key sets (metric and imperial)
- ❑ Adjustable spanners (small, medium, large) / wrench set
- ❑ Pliers (needle nose)
- ❑ Spoke key
- ❑ Bike pump ± tire pressure guage
- ❑ Quick unpick
- ❑ Screw drivers (Phillips and flat head)
- ❑ Lanolin-based lubricant
- ❑ Fabric protectant spray
- ❑ Upholstery protectant spray
- ❑ Puncture repair kit
- ❑ Velcro (adhesive)
- ❑ Scissors
- ❑ File
- ❑ Utility knife

1. Ott, K.K., Schein, R.M., Straatmann, J., Schmeler, M.R., & Dicianno, B.E. (2021). Development of a home-based telerehabilitation service delivery protocol for wheelchair seating and mobility within the veterans health administration. *Military Medicine,* usab091. doi: 10.1093/milmed/usab091
2. Sarcione, J.A., Kopee, C.L., & Trimby, A.J. (2004). Evaluation a wheelchair maintenance resource [Thesis]. Worcester Polytechnic Institute.


Phillips/Flat Reversible Screwdriver
Closed Wrench
Spoke Wrench
Adjustable Wrench/ Spanner
Socket Wrench
Double Open-Ended Wrench
Allen Keys

MASS website resources: Mobility aid repairs and maintenance

Generic maintenance

Fact sheets

- Tyre repair and replacement (PDF, 182kB)

Video

- Insurance (WMV, 1.4MB)
- Tyre maintenance (WMV, 6.5MB)
- Cleaning and lubrication (WMV, 5.9MB)
- Maintenance checks for electrical equipment (WMV, 2.2MB)
- Mechanical maintenance check - Part 1 (WMV, 5.5MB)
- Mechanical maintenance check - Part 2 (WMV, 4.7MB)

Manual wheelchairs

Fact sheets

- Adjusting your manual wheelchair, power wheelchair or mobile shower commode (PDF, 761kB)

How to use a power wheelchair (PWC)

Fact sheets

- You and Your Power Wheelchair - a guide to registration, insurance, maintenance and repair (PDF, 502kB)
- Adjusting your manual wheelchair, powerchair or mobile shower commode (PDF, 761kB)

Video

- Delivery and set up (WMV, 2.1MB)
- Battery charging (WMV, 2.1MB)
- Registration and insurance (WMV, 3.2MB)
- Use of the chair in wet or hot weather, indoor, outdoors (WMV, 6.0MB)
- Programming for individual needs (WMV, 1.8MB)

MASS website resources: Daily living aid repairs maintenance

Hoist and sling use

Video

- Hoist and sling use, maintenance checks (WMV 6101 kB)
- Battery charging and emergency lowering (WMV 813 kB)

Mobile shower commodes

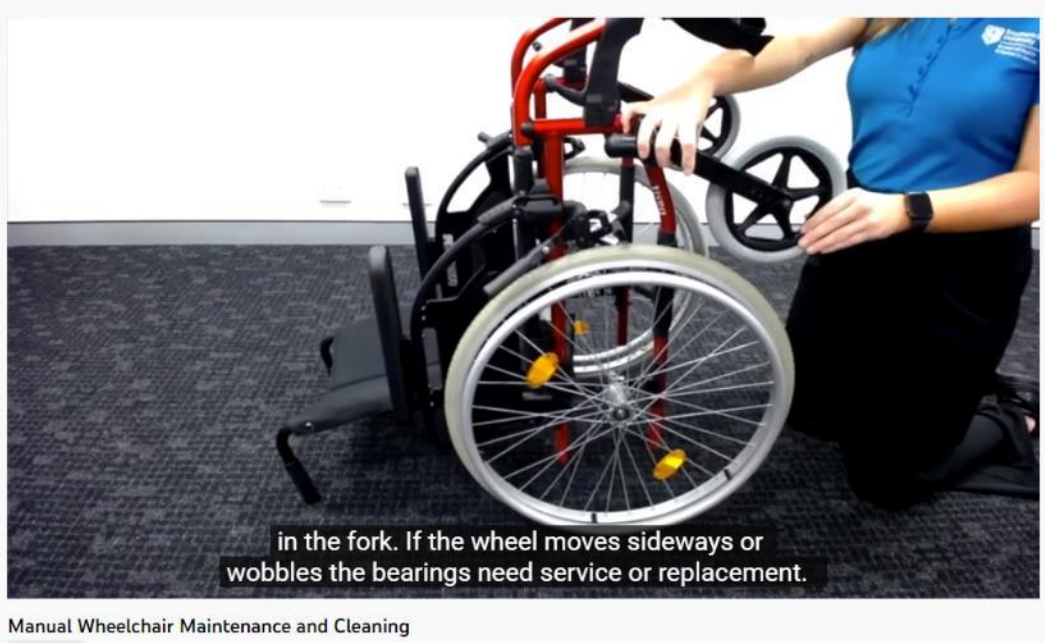
- Adjusting your manual wheelchair, powerchair or mobile shower commode (PDF 782 kB)

How to use pressure redistribution cushions, mattresses or overlays (PRC or PRM)

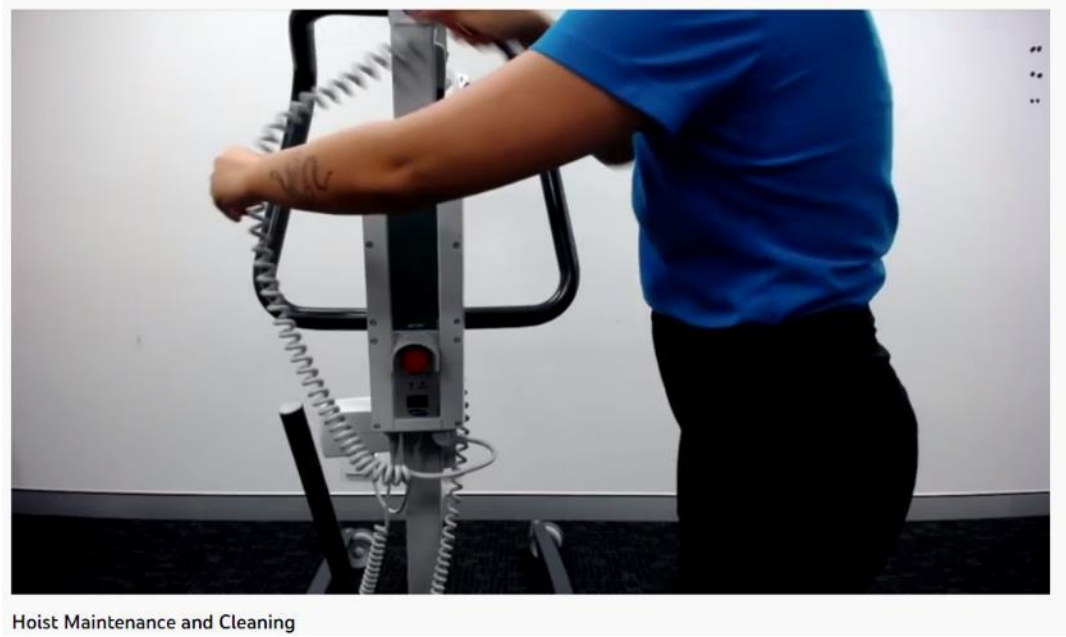
Video

- Correct use of pressure redistribution equipment and skin checks (WMV 8405 kB)
- Offloading pressure (WMV 4795 kB)
- Alternating pressure mattresses and overlays (WMV 1943 kB)
- Cushion cleaning and maintenance (WMV 2616 kB)
- Mattress and mattress overlay cleaning, maintenance and faults (WMV 2616 kB)

New MASS resources (SCU student project)



[Manual Wheelchair Maintenance and Cleaning - YouTube]



[Hoist Maintenance and Cleaning - YouTube]

Completed by Mimi McCauley & Monique Nguyen

MASS workshop resources

- Resources for inspecting, maintaining, adjusting, and cleaning a range of resources.
- Short videos
- Case scenarios

Try one
Scan here →

Sourcing other information on adjusting and maintaining

Online user manual

9. ADJUSTMENTS

Aspire Evoke 2 & Evoke 2 JNR Manual Wheelchairs have multiple adjustment points to ensure maximum comfort for users. It is very important that the below steps are followed when adjusting the wheelchair to ensure maximum safety.

Adjusting Backrest Height

1. Peel back upholstery in the lower edge of the backrest cane to reveal two bolt heads.
2. Remove 8 bolts (4 x each side) and reposition canes as required.
3. Tighten bolts and reattach upholstery.

Adjusting Backrest Tension

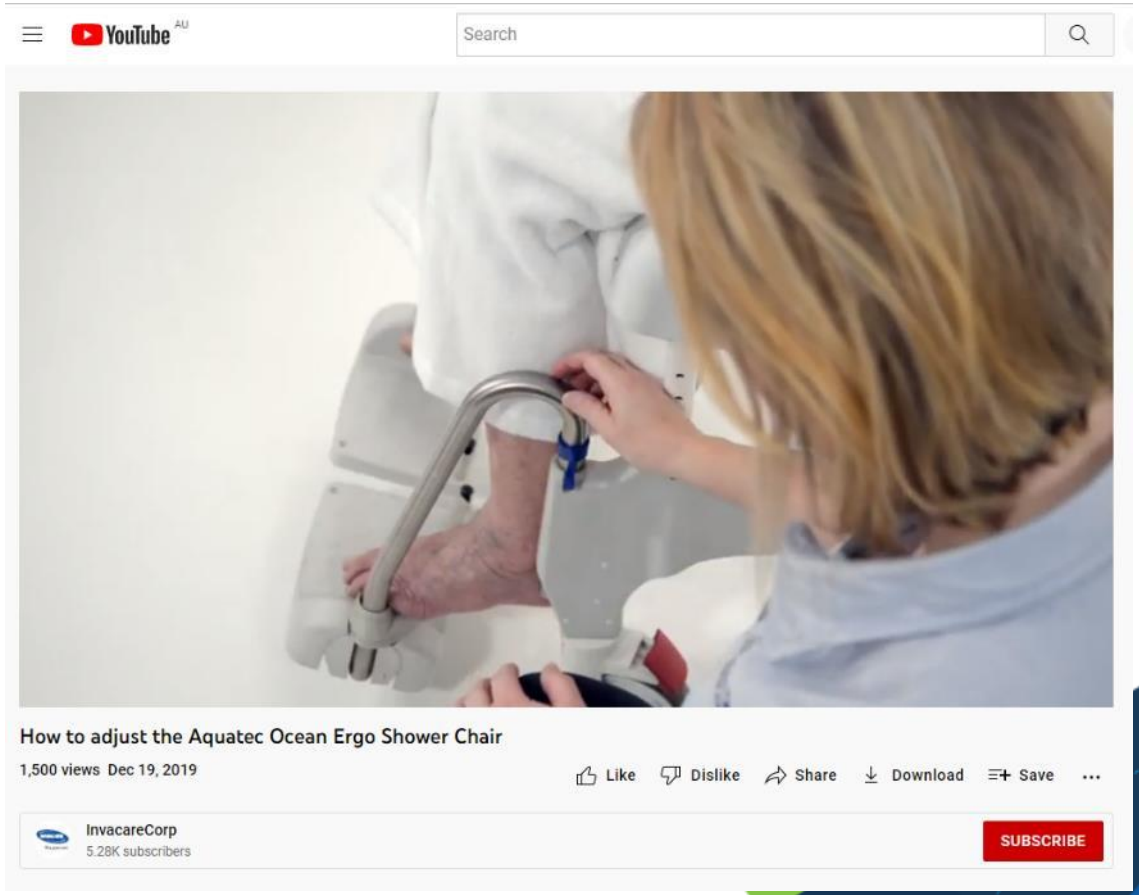
1. Peel back upholstery to reveal velcro adjustment straps.
2. Reposition straps to desired position and reapply upholstery securing in place with velcro.

Adjusting Seat Depth and Rear Wheel Position

1. Remove all bolts as shown and move backrest receiver bracket to the desired seat depth.
2. To adjust rear wheel position and height, the axle mount and receiver can be adjusted as shown.
   Once at the desired position, ensure all hardware is tightened securely.

NOTE: Ensure the rear wheels are located in symmetrical positions on both sides of the chair to maintain stability.

Online videos

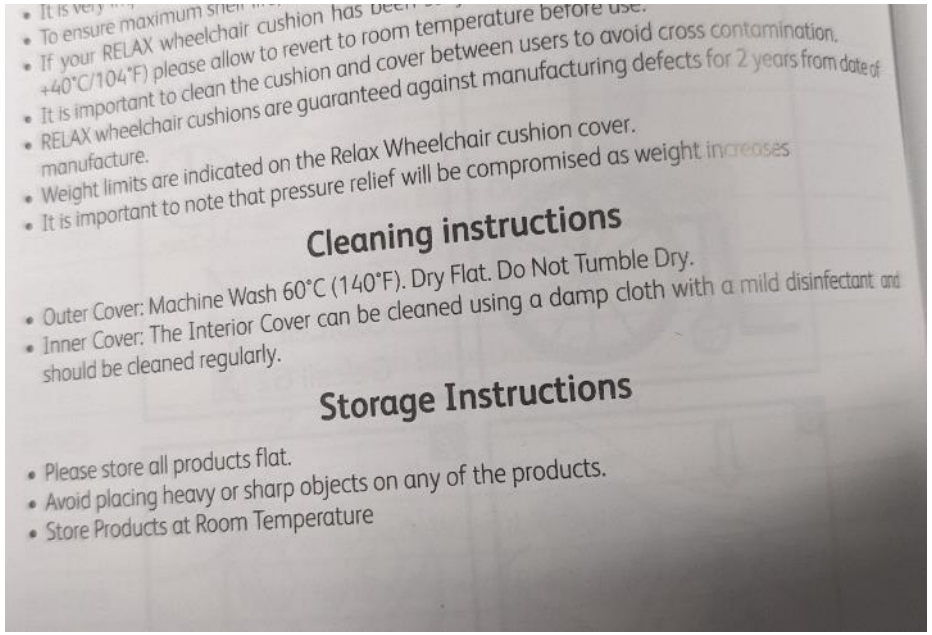


Sourcing other information on cleaning

On the item

e.g., Relax Duogel cushion

In the product manual



- To ensure maximum shelf life...
- If your RELAX wheelchair cushion has been ... before use.
- It is important to clean the cushion and cover between users to avoid cross contamination.
- RELAX wheelchair cushions are guaranteed against manufacturing defects for 2 years from date of manufacture.
- Weight limits are indicated on the Relax Wheelchair cushion cover.
- It is important to note that pressure relief will be compromised as weight increases

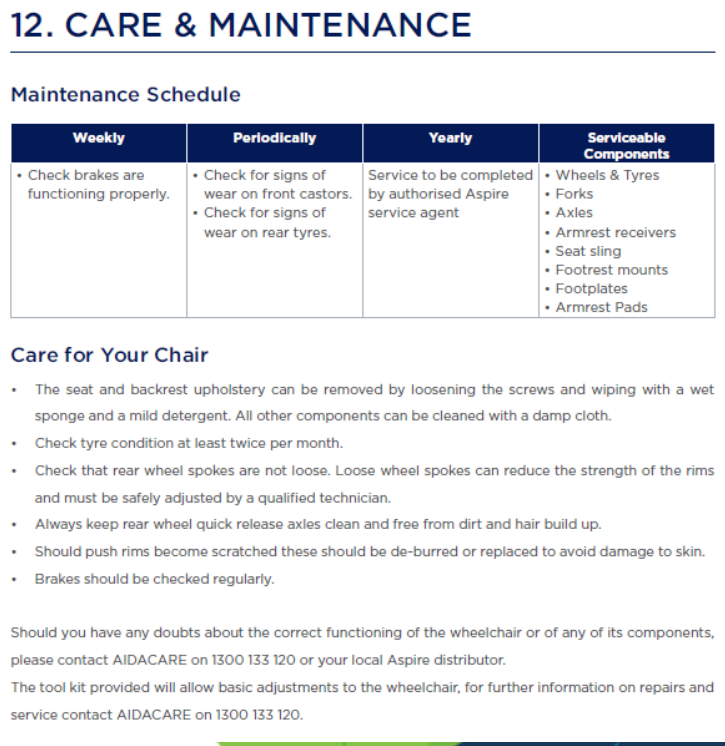
Cleaning instructions

- Outer Cover: Machine Wash 60°C (140°F). Dry Flat. Do Not Tumble Dry.
- Inner Cover: The Interior Cover can be cleaned using a damp cloth with a mild disinfectant and should be cleaned regularly.

Storage Instructions

- Please store all products flat.
- Avoid placing heavy or sharp objects on any of the products.
- Store Products at Room Temperature

Online user manual



12. CARE & MAINTENANCE

Maintenance Schedule

Weekly	Periodically	Yearly	Serviceable Components
• Check brakes are functioning properly.	• Check for signs of wear on front castors. • Check for signs of wear on rear tyres.	Service to be completed by authorised Aspire service agent	• Wheels & Tyres • Forks • Axles • Armrest receivers • Seat sling • Footrest mounts • Footplates • Armrest Pads

Care for Your Chair

- The seat and backrest upholstery can be removed by loosening the screws and wiping with a wet sponge and a mild detergent. All other components can be cleaned with a damp cloth.
- Check tyre condition at least twice per month.
- Check that rear wheel spokes are not loose. Loose wheel spokes can reduce the strength of the rims and must be safely adjusted by a qualified technician.
- Always keep rear wheel quick release axles clean and free from dirt and hair build up.
- Should push rims become scratched these should be de-burred or replaced to avoid damage to skin.
- Brakes should be checked regularly.

Should you have any doubts about the correct functioning of the wheelchair or of any of its components, please contact AIDACARE on 1300 133 120 or your local Aspire distributor.
The tool kit provided will allow basic adjustments to the wheelchair, for further information on repairs and service contact AIDACARE on 1300 133 120.

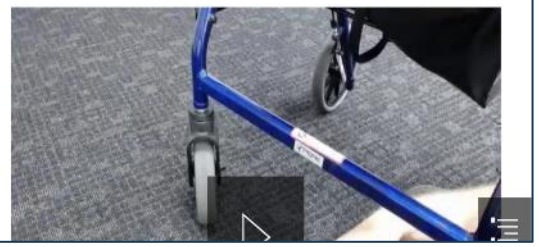
e.g., Aspire E...

Maintaining & adjusting wheeled walkers

With your wheeled walking aid, you can;

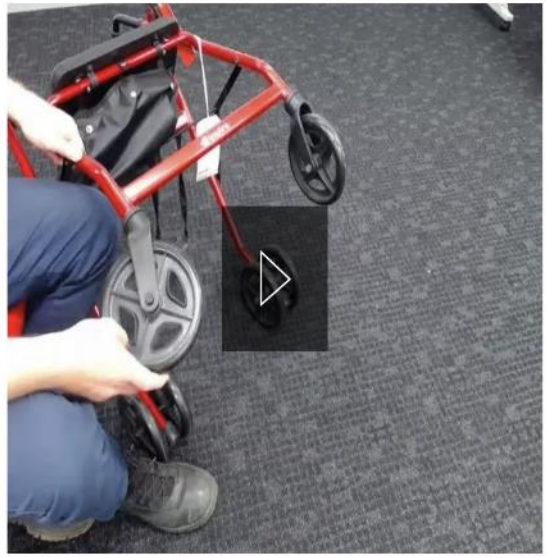
- Change the handle height
- Adjust the brake tension
- Take off and clean the castor wheels

Depending on the walking aid you are using, it may differ from the following video.



Wheeled walking aid adjustment

brake tension. In the following video you will see a general introduction to inspecting and cleaning a 4-wheeled walker.

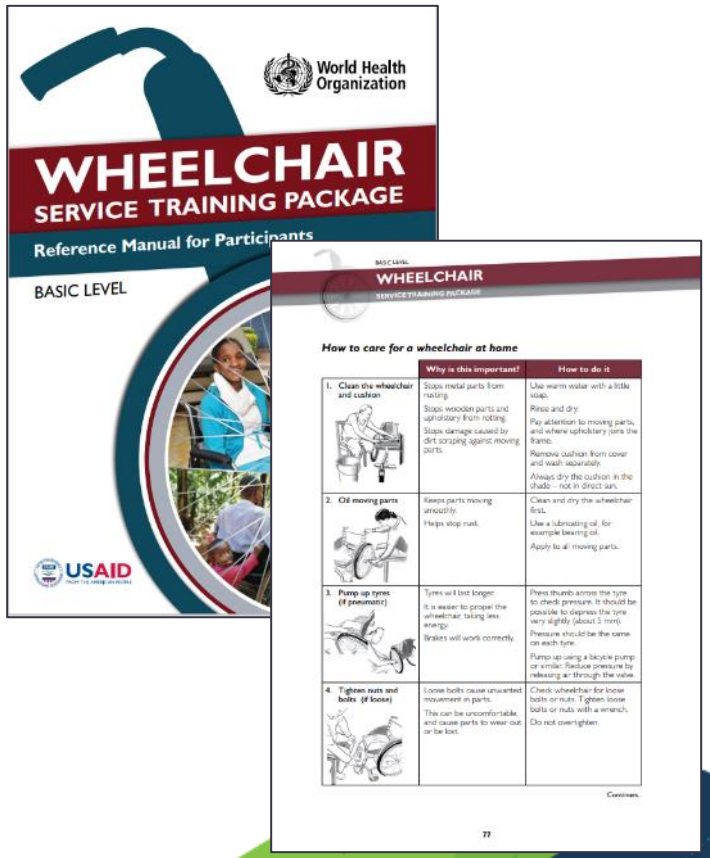


Wheeled walking aid inspection and cleaning

Maintaining manual wheelchairs

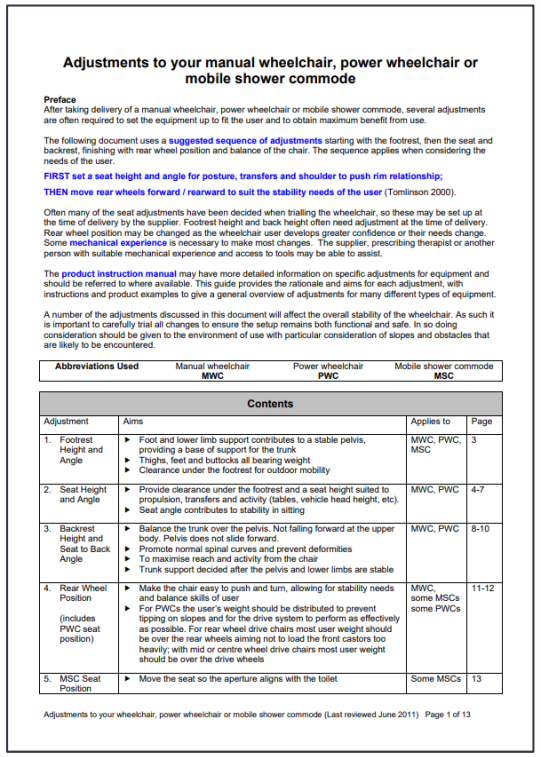
[Mobility aid resources | MASS website]

[Manual Wheelchair Maintenance and Cleaning - YouTube]



[Wheelchair Service Training Package]

Adjusting manual wheelchairs



Adjustments to your manual wheelchair, power wheelchair or mobile shower commode

Preface
After taking delivery of a manual wheelchair, power wheelchair or mobile shower commode, several adjustments are often required to set the equipment up to fit the user and to obtain maximum benefit from use.

The following document uses a **suggested sequence of adjustments** starting with the footrest, then the seat and backrest, finishing with rear wheel position and balance of the chair. The sequence applies when considering the needs of the user.

FIRST set a seat height and angle for posture, transfers and shoulder to push rim relationship;

THEN move rear wheels forward / rearward to suit the stability needs of the user (Tomlinson 2000).

Often many of the seat adjustments have been decided when trialling the wheelchair, so these may be set up at the time of delivery by the supplier. Footrest height and back height often need adjustment at the time of delivery. Rear wheel position may be changed as the wheelchair user develops greater confidence or their needs change. Some **mechanical experience** is necessary to make most changes. The supplier, prescribing therapist or another person with suitable mechanical experience and access to tools may be able to assist.

The **product instruction manual** may have more detailed information on specific adjustments for equipment and should be referred to where available. This guide provides the rationale and aims for each adjustment, with instructions and product examples to give a general overview of adjustments for many different types of equipment.

A number of the adjustments discussed in this document will affect the overall stability of the wheelchair. As such it is important to carefully trial all changes to ensure the setup remains both functional and safe. In so doing consideration should be given to the environment of use with particular consideration of slopes and obstacles that are likely to be encountered.

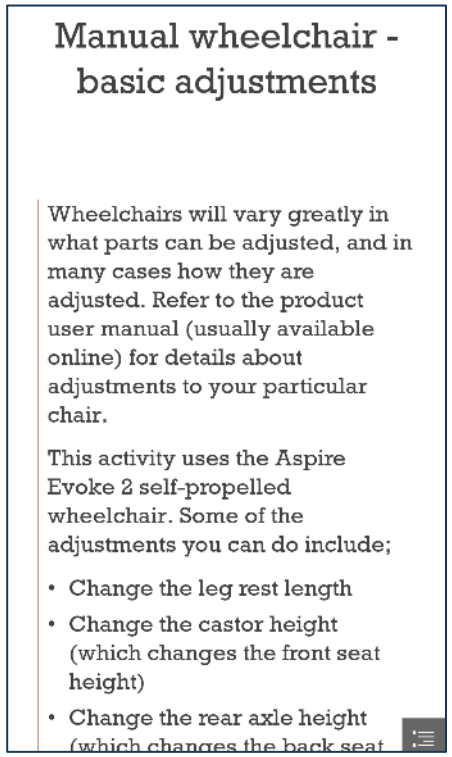
Abbreviations Used	Manual wheelchair MWC	Power wheelchair PWC	Mobile shower commode MSC

Contents

Adjustment	Aims	Applies to	Page
1. Footrest Height and Angle	▸ Foot and lower limb support contributes to a stable pelvis, providing a base of support for the trunk ▸ Thighs, feet and buttocks all bearing weight ▸ Clearance under the footrest for outdoor mobility	MWC, PWC, MSC	3
2. Seat Height and Angle	▸ Provide clearance under the footrest and a seat height suited to propulsion, transfers and activity (tables, vehicle head height, etc). ▸ Seat angle contributes to stability in sitting	MWC, PWC	4-7
3. Backrest Height and Seat to Back Angle	▸ Balance the trunk over the pelvis. Not falling forward at the upper body. Pelvis does not slide forward. ▸ Promote normal spinal curves and prevent deformities ▸ To maximise reach and activity from the chair ▸ Trunk support decided after the pelvis and lower limbs are stable	MWC, PWC	8-10
4. Rear Wheel Position (includes PWC seat position)	▸ Make the chair easy to push and turn, allowing for stability needs and balance skills of user ▸ For PWCs the user's weight should be distributed to prevent tipping on slopes and for the drive system to perform as effectively as possible. For rear wheel drive chairs most user weight should be over the rear wheels aiming not to load the front castors too heavily; with mid or centre wheel drive chairs most user weight should be over the drive wheels	MWC, some MSCs some PWCs	11-12
5. MSC Seat Position	▸ Move the seat so the aperture aligns with the toilet	Some MSCs	13

Adjustments to your wheelchair, power wheelchair or mobile shower commode (Last reviewed June 2011) Page 1 of 13

[Mobility aid resources | MASS website]



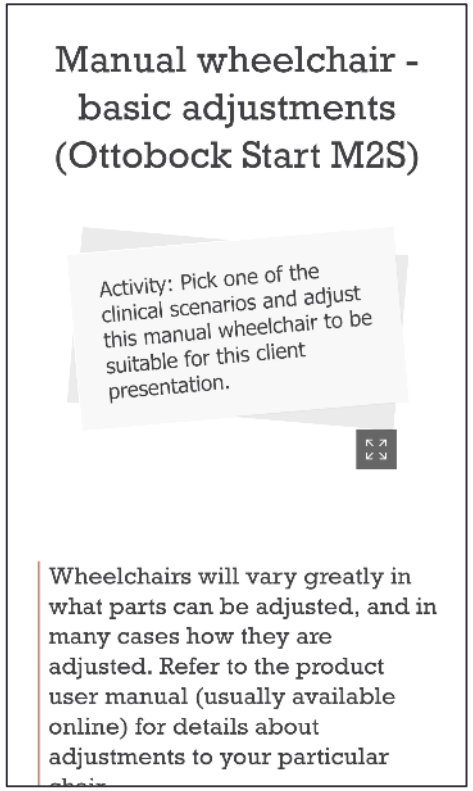
Manual wheelchair - basic adjustments

Wheelchairs will vary greatly in what parts can be adjusted, and in many cases how they are adjusted. Refer to the product user manual (usually available online) for details about adjustments to your particular chair.

This activity uses the Aspire Evoke 2 self-propelled wheelchair. Some of the adjustments you can do include;

- Change the leg rest length
- Change the castor height (which changes the front seat height)
- Change the rear axle height (which changes the back seat

[Manual wheelchair basic adjustment – Aspire Evoke 2]

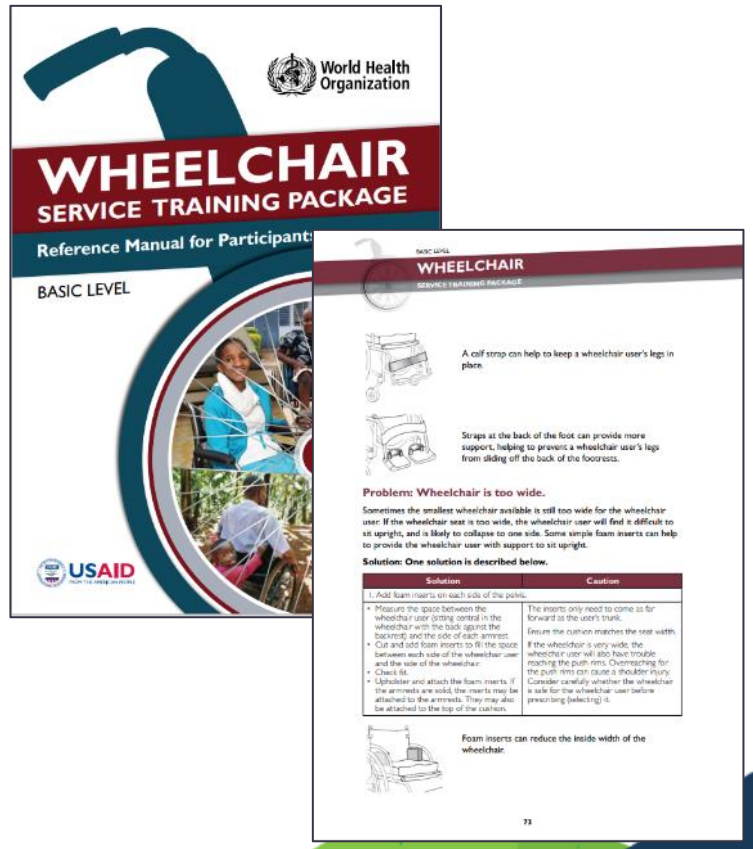


Manual wheelchair - basic adjustments (Ottobock Start M2S)

Activity: Pick one of the clinical scenarios and adjust this manual wheelchair to be suitable for this client presentation.

Wheelchairs will vary greatly in what parts can be adjusted, and in many cases how they are adjusted. Refer to the product user manual (usually available online) for details about adjustments to your particular

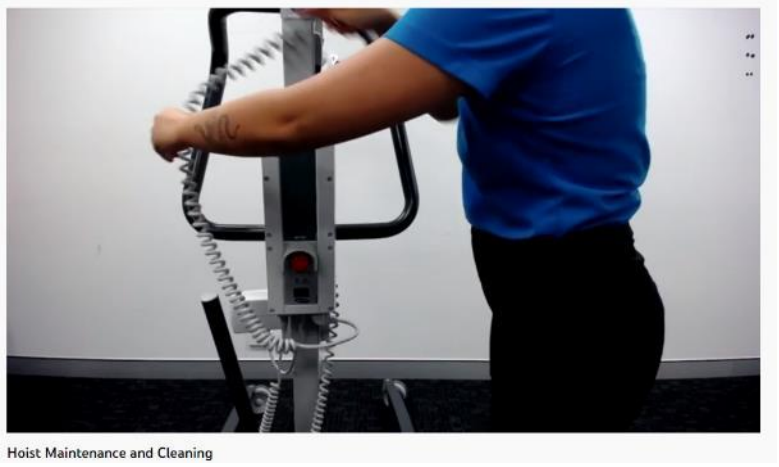
[Manual wheelchair basic adjustment – Ottobock Start M2S]



[Wheelchair Service Training Package]

Maintaining hoists

Daily living resources | MASS Website



Hoist Maintenance and Cleaning

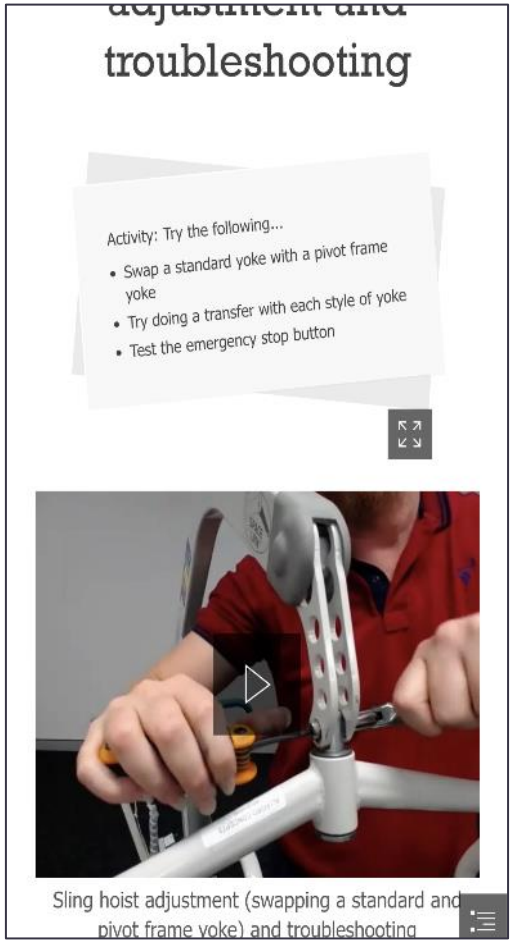
Hoist Maintenance and Cleaning - YouTube

Maintenance Checklist – Hoists

Item	Task and Instructions
General	❒ Check all parts for external damage or wear ❒ Check all hardware, attachment points and stress parts, such as slings, hooks, and any pivot points for signs of wear, cracking, fraying, deformation, or deterioration ❒ Verify that the hand control is functional (lifting and leg movements) ❒ Check the emergency stop button
Batteries	❒ Charge the battery regularly – if the hoist is used today, it should be charged today
Controls	To ensure reliable operation of the hoist, check that: ❒ All plugs are plugged in fully ❒ Control or cord is not cracked, stretched, or damaged
Actuator and Spreader Bar	Make a visual inspection to ensure: ❒ Spreader bar is operating freely ❒ High tensile pin attaching the spreader bar to the boom is moving freely but not excessively; not worn or rounded off at end ❒ Bolt that secures the pin through the spreader bar to the boom is secure ❒ Any clips, rings, or other means of attaching the actuator or spreader bar to the boom are intact and in good condition
Base legs, Mast, and Boom	Make a visual inspection to ensure: ❒ Legs can spread their full distance and lock in the open and closed positions ❒ All bolts on the base legs are secure and none are missing ❒ No visible cracks or bends in the base legs, mast, or boom

Hoist & sling maintenance checklist | MASS

Adjusting hoists



Sling hoist adjustment (swapping a standard yoke and pivot frame yoke) and troubleshooting

Maintaining pressure cushions

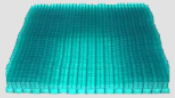
Daily living resources | MASS Website

Cleaning and maintenance Checklist – Cushions

Please note:

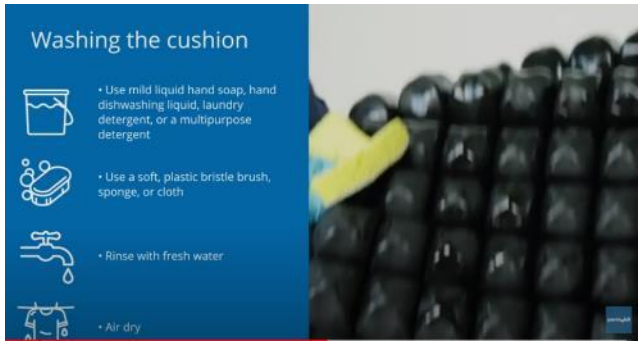
- Cleaning and disinfecting are separate processes. Cleaning must precede disinfection.
- Before use by a different individual, clean, disinfect and check the product for proper functioning.
- If the integrity of the cushions have been compromised, do not use and seek replacement through MASS.

Inspection Checklist – Cleaning the cushions

Cushion	Task and Instructions
'Action Gel' Action Pilot Gel Cushion 	Cushion cover: ❒ Machine wash (60°) with Napisan Cushion: ❒ Gently scrub and wipe down with damp cloth and bleach or disinfectant (Viraclean) Maintenance: ❒ Check for any rips or damage to cushion cover ❒ Check gel cushion for any large rips or tears in the gel
'EQUAGEL' General Equagel Cushion 	Equagel cushion cover: ❒ Cold machine wash with detergent ❒ Air or tumble dry with NO heat Equagel component: ❒ For basic cleaning, hand wash in warm soapy water ❒ For sanitation purposes, wash in a diluted bleach solution bath using 1 part household liquid bleach per 9 parts water Maintenance: ❒ Check pressure cushion and cover for any tears or damage

Cushion Cleaning Checklist | MASS Action gel, Equagel, Relax Easy, ROHO

Maintaining & cleaning pressure cushions[1]



Cleaning a ROHO Cushion - YouTube

Action Products - YouTube

Cleaning & maintaining a hybrid foam-gel pressure cushion (Axiom SP)

General advice for cleaning pressure cushions and covers

Note 1: Items selected based on some of the most common prescriptions at MASS and representation of each type of cushions

Adjusting pressure cushions

[ROHO Cushions Set Up & Adjustment - YouTube]

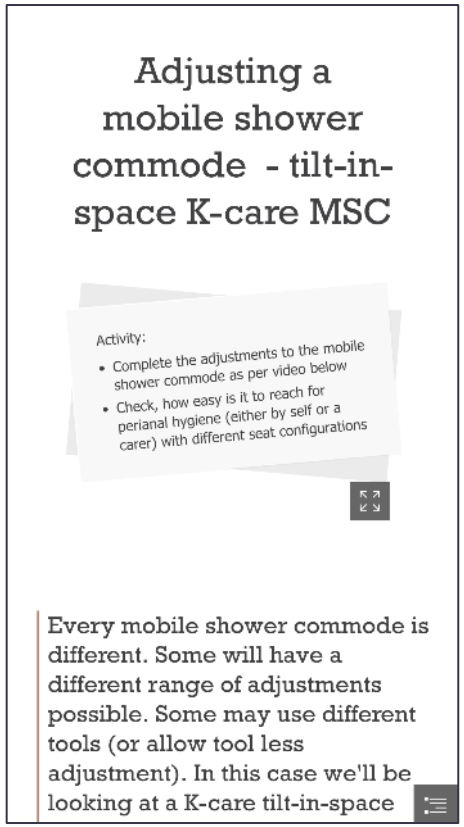
[Adjusting a highly configurable foam pressure redistribution cushion (Domino Inserto)]

[Adjusting a Varilite cushion - YouTube]

Maintaining & adjusting bathing / toileting aids

Adjusting & maintaining a bath transfer bench

Adjusting bathing / toileting aids



Adjusting a K-care tilt-in-space mobile shower commode

How to adjust the Aquatec Ocean Ergo Shower Chair - YouTube

Maintenance checklists (peer-reviewed)

- Engineer cane/walker inspection
- Engineer wheelchair inspection
- Wheelchair maintenance assessment tool manual wheelchairs (p213-28)
- Wheelchair maintenance assessment tool power wheelchair (p238-54)
- Wheelchair Components Questionnaire [1]
- Wheelchair maintenance checklist (p90-93)[2]

1. Rispin, K., Dittmer, M., McLean, J., & Wee, J. (2017). Preliminary reliability and internal consistency of the Wheelchair Components Questionnaire for Condition. *Disability & Rehabilitation: Assistive Technology, 12*(8), 852-856.
2. Sarcione, J.A., Kopec, C.L., & Trimby, A.J. (2004). Evaluating a wheelchair maintenance resource. Thesis, Worcester Polytechnic Institute.

Responsibilities & best practice

CLIENT

- Cleaning
- Simple maintenance
- Early detection and reporting of issues
- Proper use and following manufacturers instructions

PRESCRIBER

- Client education on care and maintenance
- Periodic equipment inspection and report/repair (ideally before warranty ends)
- Consider backup equipment / plans

MASS

- Arranging repairs and maintenance for wear and tear
- Providing replacement equipment at end of economically serviceable life
- Scheduled servicing of hoists and PWCs

Refer to the MASS General Guidelines section 12

Contacts

Dr Kieran Broome, Occupational Therapist

Advanced Clinical Educator, Medical Aids Subsidy Scheme

Bridget Manning, Speech Pathologist

Advanced Clinical Educator, Medical Aids Subsidy Scheme

Email: MASS-Education@health.qld.gov.au

Ph: 3136 3526

Local MASS service centre

For repairs

Brisbane email: MASS-Repairs@health.qld.gov.au

Brisbane phone: 3136 3525

Townsville email: MASS-Equipment-TSV@health.qld.gov.au

Townsville phone: 4433 8000

Feedback

Please complete our feedback form to receive a certificate of attendance.

Link to feedback form