

There was no published evidence (Levels 1 to 4) that lightweight, manoeuvrable, individualised manual wheelchairs reduce shoulder pain/injuries in people with spina bifida, who use a manual wheelchair as their main form of mobility

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CLINICAL SCENARIO: Adults with spina bifida who use a wheelchair as their main form of mobility often complain of shoulder pain, and suffer shoulder injuries. During their childhood and adolescence, these adults did not have the benefit of lightweight, individualised, manual wheelchairs.

Children and adolescents with spina bifida, who use a wheelchair as their main form of mobility, now have the opportunity of receiving lightweight, manoeuvrable, manual wheelchairs. These chairs are more costly than standard, manual, folding wheelchairs.

This CAT investigated whether individualized, lightweight, manoeuvrable wheelchairs should be provided throughout childhood and adolescence to people with spina bifida, to prevent pain and shoulder injuries.

FOCUSSED CLINICAL QUESTION: Do lightweight, manoeuvrable, individualised, manual wheelchairs reduce shoulder pain/injuries in people with spina bifida, who use a manual wheelchair as their main form of mobility?

SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:

- No Level I, II, III, or IV evidence located.
- Level V evidence (expert opinion) was located through articles; advertising material; discussion with the medical specialist, spina bifida clinic at the Children's Hospital at Westmead; therapists; manufacturers of individualised manual wheelchairs and wheelchair sales people.
- Summary of key findings from Level V evidence:
 1. The position of the axle, and the height of the wheelchair seat, appear to have an impact on ease of propulsion by the user.
 2. Lightweight manoeuvrable wheelchairs are reported to be easier to handle, and increase energy conservation, for the child/young person.
 3. Education in propulsion methods can help children/young people use a style that reduces energy expenditure.
 4. Regular active exercise for wheelchair users appears to result in more functional, shoulder pain free years.

CLINICAL BOTTOM LINE:**Based on Level V evidence**

These children/young people should have the opportunity to:-

1. Use a lightweight manoeuvrable manual wheelchair, which is set up to meet their individual needs;
2. Learn energy conserving wheel propulsion methods;
3. Build up good upper body strength;
4. Stretch to maintain more normal joint range of movement;
and
5. Participate in regular sport and exercise, as these activities have a positive effect on wheeling efficiency, aerobic capacity, muscle strength and self concept.

In the process of appraising related literature, a number of recommendations regarding appropriate wheelchair prescription/recommendations for these children and young people with spina bifida became apparent. These have been collated into a guideline (attached).

Limitation of this CAT: This critically appraised paper has not been externally peer-reviewed.

SEARCH STRATEGY:**Terms used to guide Search Strategy:**

- **P**atient/Client:- Spina bifida; spinal cord injury; paraplegia, overuse syndrome; shoulder pain; shoulder injury; rotator cuff injury; hand pain.
- **I**ntervention:- manual wheelchair; sports wheelchair; manual folding wheelchair; light weight, ultralight ultralite, manoeuvrable, shock absorbing, individualised, fixed frame, biomechanics, propulsion.
- **C**omparison: Nil
- **O**utcome(s): Nil
- **L**imits: Nil

Sources of evidence searched

EMBASE	CINAHL	Cochrane Library	Medline
OT Seeker	OVID	Pedro	Google

INCLUSION and EXCLUSION CRITERIA

No suitable studies found and so inclusion and exclusion criteria not used.

RESULTS OF SEARCH

The following sources were investigated to find relevant Level V evidence: (The highlighted references were the ones found to be most useful)

1. "Recipe for a Wheelchair Prescription: Spina Bifida in the new Millennia" by Gloria Leibel B.Sc PT; Linda J Patrick B.Sc PT. Bloorview MacMillan Children's Centre 2002. http://www.seatingandmobility.ca/ISS2002/ToSunnyHill2/iss2002html/036_Recipe_foraWheelchairPrescription.htm
2. "Wheeling Efficiency in Children with Spina Bifida" by Bonita J. Sawatzky PhD; Heather M. Macdonald B.Sc; Nicola Valentine B.Sc; OT; and Kathryn Duff BPE through: www.seatingandmobility.ca/iss2002/ToSunnyHill/iss2002html/023
3. "Physical Activity Capacity in Children with Myelomeningocele" by James C. Agre et al, Departments of PM & R and Epidemiology, University of Minnesota, Minneapolis, MN 55455 & Roland Birkebak MD and Randle Schmalz PhD, the Gillette Children's Hospital, Saint Paul, MN 55101
4. "Shoulder pain: A comparison of (adult) Wheelchair Athletes and (adult) Non-athletic Wheelchair Users" by Heather Fullerton, Jeffrey Borckardt and Alan Alfano. **Medicine & Science in Sports & Exercise**, Vol 35(12) December 2003.
5. "Manual Wheelchair Use and Upper extremity Pain and Injury" PowerPoint presentation: Alicia Koontz, Phd, ATP, Center of Excellence in Wheelchairs & Related Technology, 2001 http://www.herlpitt.org/Presentations/AASCIPSW2002/Koontz_WCBio.ppt
6. "Wheelchair Racing efficiency" by RA Cooper, ML Boninger, R Cooper, RN Robertson, FD Baldini. **Disability & Rehabilitation**; 25(4-5): 207-12, 2003 Feb 18-March4.
7. "Issues when prescribing paediatric manual wheelchairs" by Christine Turner, Invacare Clinical Application Specialist. **British Journal of Therapy and Rehabilitation**, August 2001, Vol 8, No 8
8. "The Manual Wheelchair Training Guide" 1998; ISBN 1-882632-10-9.
9. "On the Move: Increasing the Options" 1992 NSW Department of Education. ISBN 0 7305 9021 6.
10. "Effect of seated posture on interface pressure in children who are able-bodied & who have myelomeningocele by N. Vaisbuch, S. Meyers, PL Weiss. **Disability & Rehabilitation**: 22(17); 749-55, 2000 No 20.
11. "A Pilot Study on Community Usage of a Pushrim-Activated. Power-Assisted Wheelchair (PAPAW) by Shirley G.Fitzgerald PhD et al; Human Engineering Research Laboratories, Pittsburgh, PA 15206
12. "Titanium: What's the Big Deal" by Bob Vogel, **New Mobility** July 2003
13. "Titanium Wheelchairs" & "Are we adding Insult to Injury? RSI and the manual wheelchair user" through: www.gtkrehab.com.au
14. Personal notes taken at PAFG 2004 meeting: Presenters – Michael Callahan, manufacturer of individualized manual wheelchairs & Errol Hyde, owner of Wheelchair Sales. Both presenters use manual wheelchairs as their main form of mobility.

IMPLICATIONS FOR PRACTICE

Guidelines for prescribing a manual wheelchair for children/young people with Spina Bifida were developed from reading and assimilating the literature retrieved following a search of relevant literature for this CAT.

When prescribing a manual wheelchair for a child/young person with spina bifida, who uses a manual wheelchair as their main form of mobility, the chair needs to be:-

1. A tool for an independent lifestyle and so must be maneuverable to maximize mobility and allow the child to keep up with peers.
2. Lightweight and easy to handle for energy conservation for the child as well as for carers. *(Note: Titanium is the strongest lightweight metal presently used for manufacturing. These wheelchairs are reported to absorb the shock of everyday wheeling and reduce fatigue for the user, but these chairs are more expensive and not all parts of chair are necessarily made of titanium. During periods of rapid growth it would be difficult to justify the increased expense but once the young person has reached adult height these lightweight chairs should be considered to reduce the risk of shoulder injuries – research is required to validate this information)*
3. Configured for ease of movement e.g. appropriate position of axle; seat height; back height to ensure ease of arm/shoulder movement yet give support; weight of legs to be under thighs near the front of the cushion; rigid frames to increase maneuverability; appropriate degree of seat rake to correctly distribute weight of child; 'tippiness' that child can handle; degree of camber considering widths of doors etc.
4. From 1st chair prescribed, fitted with a cushion to accustomise the child to the time when skin integrity could be an issue; and, if the child/young person has to sit in the chair for the majority of each day consider if a pressure cushion is required. Cushion to be 1"/24.5mm longer than seat. For social and hygiene reasons, a second cushion cover should be considered when the child is incontinent and is unable to stay dry between catheterization.
5. Fitted with an appropriate seat length so that the seat/cushion is not against the calves of the child.
6. Manufactured so as to encourage a good posture eg rake of seat.
7. Equipped with adjustable features (eg handles to accommodate different heights of carers).
8. Aesthetically appealing to child and family.
9. Functional (a)if there are postural supports &/or sides to the chair, these must not impede independent transfers; b) section to hold school books eg net under chair so that the child does not put heavy backpack on the back handles of chair as this would reduce maneuverability of chair etc.
10. Suitably set up for the environment of the child a) if anti- tip bars are required ensure they do not impede the child going up/down kerbs in their local community b) if local area does not have pavements/ has rough ground, frog leg front wheels assist in absorbing shock.
11. The correct size (ie not to allow for growth but rather consider how the chair can "be grown" when the child grows).

12. Pushrim-Activated Power-Assisted Wheelchairs (PAPAW) may be a solution as a second wheelchair for young adults when they have to cover long distances &/or are required to wheel up hills eg at TAFE though there, at present, is insufficient evidence.

Other considerations which were highlighted in the journal articles/discussions included:

13. Education in propulsion methods should be made available to ensure the children/young people use a style that reduces energy expenditure. Style recommended involves the arm creating a full circular motion following the wheel.
14. Child establishing a regular habit of 'sit-ups' + movement of upper body, whilst in their wheelchair as this is useful in increasing upper body strength and in looking after skin integrity.
15. The need for children/young people who use their wheelchair for all their mobility, to consider receiving stretching to maintain more normal joint range of movement.
16. In the article on "Wheeling Efficiency in children with Spina Bifida": Both strength and involvement in physical activity had an effect on a child's wheeling efficiency.
17. Children who participated in sports on a weekly basis had a significantly higher total self concept score than children who were involved in activities on a monthly basis and those who did no physical activity.
18. These children and young people should be encouraged to participate in regular sport and exercise as these have a positive effect on wheeling efficiency, aerobic capacity, muscle strength and self concept.