Out and About: Clinical Considerations for Wheelchair Seating Systems and Transportation

Jenni Dabelstein, BPhty, MHSc, MBA

Abstract
Getting out and about easily is a gateway to community participation, which in turn is highly correlated with perceived quality of life. Difficulties functionally accessing transport can prove a formidable barrier to community access for both wheelchair users and their families and carers.

The way each user functionally achieves a safe and satisfactory transport outcome can be highly individualised, therefore the key factors in the process must be clearly understood by the wheelchair prescriber in order to optimise this outcome. This paper highlights a clinical framework for weighing prescription choices in each of three typical situations, which is explored in the context of three typical situations.

Optimisation of functionality during transport will include minimising risk of injury, effort and time commitments for both carers and wheelchair users during loading and unloading, as well as maximising safety for all occupants while the vehicle is on the road. Factors such as wheelchair and vehicle design features as well as transfer techniques are highlighted. Additionally, while acknowledging that safety is a basic requirement, the author encourages prescribers to consider transport primarily as a functional issue during the prescription process, and to weigh transport needs as for other key functional requirements.

The author recommends the use of a Transport Plan and consistent implementation of user training as part of the extended prescription process, to ensure both short and long-term success and safety during vehicle transport.

Keywords
wheelchair transportation, wheelchair prescription, mobility, community access

Introduction
Getting out and about easily is a gateway to community participation, which in turn is highly correlated with perceived quality of life (Aronson, K.J. 1997; Scherer, M.J. & Glueckauf 2005). As most wheelchair users travel by vehicle, transportation methods therefore require careful consideration during the prescription process.

Because of both the importance of easy access to transport and the highly individual nature of the way this access is functionally expressed, a full understanding of transport requirements is often a key factor that will assist clinicians when weighing up alternative options during the prescription process.

Objectives
This paper highlights a clinical framework for exploring and identifying prescription choices in each of three typical transport situations commonly observed in clinical practice:

a) the user will independently transfer themselves and the chair into the car and drive;
b) the wheelchair user will transfers into the car (with or without assistance) and chair is stowed in the vehicle by a carer; and
c) the user will travel in their chair, in the vehicle.
Method
As part of the assessment process, transport requirements must be documented and understood by the clinician.

Firstly, the clinician should develop a clear understanding of how the transport task will be framed for each individual client. It is useful to deconstruct the available information using the classic when, where, who, what, why factors (Trumbull, 1888). Pertinent questions include:

- When, and how often, will the wheelchair user generally travel?
- What other options may be less frequently used?
- Where will the wheelchair user physically be situated in the vehicle when they travel, and how will they get there?
- Where (physically) will loading/unloading generally take place - indoors, outdoors, garage etc.
- Who will be available to assist? If carers are available, what are their capabilities?
- What type of vehicle is generally in use? If a family vehicle or other vehicle is in regular use, what is that vehicle?
- Why do all the above habits or expectations exist? Is there scope for change?

Having established a picture of how the wheelchair user will generally use transportation, the clinician must then try to quantify the key variables which will translate to perceived success in this endeavour.

Often it is useful to consider transport issues as a 3-stage process, consisting of:
1. loading
2. travel
3. unloading

Within each stage, the five key factors most often in play include:

a) effort
b) time commitment
c) general safety
d) injury risk
e) wear and tear on equipment

While this list is not exhaustive and each of these key factors may play a more or less prominent role within each transport stage, prescribers should consider how they apply to both the wheelchair user and their carers, and also from a short-term and a long-term perspective.

The above framework can easily be applied to each of three typical transport situations commonly observed in clinical practice:

a) the user will independently transfer themselves and the chair into the car and drive;
b) the wheelchair user will transfers into the car (with or without assistance) and chair is stowed in the vehicle by a carer; and
c) the user will travel in their chair, in the vehicle.

Results
Where the user will independently transfer themselves and their chair into the car and drive, loading tends to be the most critical stage, and effort plus safety tend to be the most critical short-term factors.

Physical approach to the vehicle for entry is critical, so the physical interface of the vehicle with the wheelchair must be assessed, in conjunction with any other aids commonly used, such as a slide board. Once the transfer is complete, minimising weight of the chair is critical to allow the user to most easily lift it across and into the car. Apart from wheels, fewer detachable components are desirable, and design of the chair and undercarriage will also contribute substantially to how easy the unit is to grip and smoothly pull across. If a roof hoist is used, consideration needs to be given to how easily the chair can be secured into the hoist mechanism and wear and tear issues can become important. Minimising risk of injury to the user is vital to maintaining independence over time.

Where a carer will transfer the chair into the car and the user will be a passenger, both loading and unloading tend to be equally important, and effort and safety issues need to be considered from both user and carer perspectives. In addition, there is often a concern re time commitment and the issue of managing injury risk for the carer (especially if the carer is a paid employee).
Physical approach and technique for the inward transfer of the user as above is still important, but manual handling technique and capability of the carer is equally important. The design and shape of the wheelchair in relation to the vehicle storage compartment must be considered. To reduce weight and aid stowing of a wheelchair in the boot, a folding frame and removable components are often a plus, but assembly and reassembly can add to time commitment. In cases where the vehicle in use is a station wagon or SUV, often a rigid frame chair with less weight and fewer removable components may actually be more convenient.

Where the user will occupy their chair during travel, loading and unloading phases usually become more straightforward, although the method of entry/exit should still be carefully assessed, and height limitations documented, if they exist. The travel phase is generally the phase most influential in this scenario, as it requires the chair to be suitable for occupied transport, readily able to be secured by carers, and supportive enough to ensure occupant comfort and safety throughout the trip.

Australia currently has no mandated consistent testing of mobility bases for occupied transport, nor any legislative requirement for wheelchairs occupied by users during transport to meet any specific standards. Nevertheless, most high-rehab chairs sold in Australia are designed for occupied transport, are marketed as transport-ready by their manufacturers, and are tested to various international benchmarks, such as ANSI/RESNA WC19 and ISO 7176-Part 19, the latter of which is the equivalent to AS/NZS 3696.19:2009. A good summary of the relevant standards can be found online in the 2011 ARATA News and is reproduced in Figure 1 for reference purposes.

As most users who travel in their wheelchairs have significant physical impairments, the seating system installed in their wheelchairs is also significant. It is generally recommended (although not legally required) that users who travel regularly in their chairs have an upright, shoulder-height solid backrest with a robust mounting system (transport-tested and recommended if possible), a headrest and a chest harness. Any components which are easily detachable should be removed and safely stowed for the journey.

Clinicians should be aware that, in almost all cases, it is theoretically safer (in terms of reducing risk of injury in the case of a crash) for the occupant to travel in a regular car seat than to travel in an occupied wheelchair. Additionally, from a prescriber point of view, selecting and decking out a wheelchair to make it suitable for occupied transport can be counterproductive to other functional goals. If occupied transport is infrequent, and/or discretionary (that is, a matter of convenience rather than necessity), the therapist must carefully weigh transport needs against other functional goals during the prescription process.

**Figure 1: Standards Related to Wheelchair Transportation**

To meet duty of care requirements, prescribers should satisfy themselves that models under consideration meet adequate safety standards. An excellent and current reference for wheelchair standards and crash-testing exists at the Rehabilitation Engineering Research Center (RERC) on Wheelchair Transportation Safety website ([www.rewts.org](http://www.rewts.org)).
**Discussion**

A logical exploration of the travel requirements and habits of each wheelchair user as described above should be part of every wheelchair prescription. Ideally, this should be documented and used to construct a Transport Plan for each individual.

The Transport Plan need not be lengthy or time-consuming, but should deconstruct the available information to concisely identify the classic *when, where, who, what, why* factors (Trumbull, 1888) factors that form a basis for equipment selection to meet the desired transport function, and also clearly identify the key factors most relevant to each of the 3 transport stages. The Transport Plan can be used as a basis for risk management and also to identify training needs or other additional factors, beyond the equipment per se, which will be critical to promoting easy community access.

The use of a Transport Plan and consistent implementation of user training as part of the extended prescription process will help to ensure both short and long-term success and safety during vehicle transport, and also provide an appropriate clinical record.

**Correspondence**

Jenni Dabelstein:
gizmorehab@optusnet.com.au

**References**

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