

Mid-wheel drive powered wheelchairs

AGENCE D'ÉVALUATION DES TECHNOLOGIES
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Summary

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FOREWORD

MID-WHEEL DRIVE POWERED WHEELCHAIRS

Mid-wheel drive powered wheelchairs (MWDs) have been extremely popular in the American and Canadian markets for the past few years. The drive wheels of this type of chair are positioned in line with or near the centre of gravity of the chair, while the drive wheels of other powered chairs are located towards the front or the rear. This characteristic provides greater manoeuvrability in confined spaces. In Québec, more and more people who need mobility aids have been applying for this type of wheelchair.

That is why the *Régie de l'assurance maladie du Québec* (RAMQ), which administers the program covering devices that compensate for physical deficiencies, called upon AETMIS to shed light on the advisability of adding MWDs to the list of insured devices and, if so, to recommend specific eligibility requirements for potential users.

The analysis we conducted revealed that powered wheelchairs were generally unreliable in the United States during the last decade. This problem led to the enactment of laws commonly known as *wheelchair lemon laws*. Their primary goal was to oblige wheelchair manufacturers and dealers to fulfill their repair or replacement warranties, and to do so within a reasonable amount of time. Although this situation is not directly applicable to Québec, it does alert us to the need for caution in managing our fleet of powered wheelchairs.

Although rather limited, the comparative data that we did find allow us to conclude that MWDs apparently perform as well as conventional powered wheelchairs. As a general rule, some of the characteristics of MWDs are as good as or even superior to those of rear-wheel drives (RWDs) and front-wheel drives (FWDs), especially their shorter turning radius and narrower turning space. They also seem to be reasonably priced. On the other hand, we found no studies detailing specific eligibility requirements for users of these wheelchairs.

In light of this analysis, AETMIS recommends that RAMQ add MWDs to the list of insured mobility products, provided that it can be verified that they comply with standards, which should also be the case for any other type of powered wheelchair. Furthermore, with respect to performing such standards testing, it would be advisable to provide for both operational and financial partnership or collaborative agreements among all the parties concerned.

In submitting this report, AETMIS hopes to provide RAMQ with information that will help it administer its mobility-aid program for people with physical disabilities. This information should also help health-care professionals in Québec offer services that best meet the specific needs of those requiring powered wheelchairs.

Renaldo N. Battista
President and chief executive officer



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We would also like to acknowledge the expertise and enthusiasm shown by Pierre Vincent, librarian and information specialist, and Micheline Paquin, library technician, both staff members at the AETMIS information library. Their assistance was essential in locating and obtaining the documentation necessary for this study.

SUMMARY

CONTEXT

The amounts that the *Régie de l'assurance maladie du Québec* (RAMQ) must allocate to its budget for powered wheelchairs have been rising gradually each year. During the 2001–2002 fiscal year, RAMQ paid \$6.8 million for 1 150 powered wheelchairs, compared with \$8.1 million for 1 326 of them in 2002–2003. For these two fiscal years, the cost of repairing currently insured wheelchairs rose from \$4.4 million to \$5.7 million, with expenditures totalling \$11.2 million and \$13.8 million, respectively.

For decades now, wheelchairs have been powered by either a rear-wheel or a front-wheel drive system. In 1996, however, a new drive configuration appeared on the scene, giving us mid-wheel drive powered wheelchairs (MWDs). The main drive wheels of these chairs are positioned in line with or near their centre of gravity.

RAMQ'S QUESTIONS

RAMQ asked whether it would be advisable to add MWDs to its list of insured mobility products and, if so, which eligibility requirements should apply.

ASSESSMENT METHOD

With these questions in mind, AETMIS began by determining which laws, regulations and standards govern the manufacture, distribution and sale of powered wheelchairs. The next step involved searching for controlled studies on the effectiveness, safety and cost of the different models of powered wheelchairs available on the market.

RESULTS: LAWS, REGULATIONS AND STANDARDS

Powered wheelchairs are classified as medical devices in both the United States and Canada. Certain laws and regulations spell out minimum requirements for some of their characteristics. Compliance with wheelchair standards is voluntary for manufacturers in both countries; however, this system of voluntary compliance led to a particular legal situation in the United States. In the early 1990s, over 38 states were obliged to enact what are known as *wheelchair lemon laws* in order to protect individual consumers as well as public or private payers against the frequent breakdowns and lengthy downtimes of powered wheelchairs. In 1998, a federal law applicable to all 56 states, territories and dependencies was enacted to cover all assistive technology, not only powered wheelchairs as do the laws of the individual states.

RESULTS: COMPARATIVE STUDIES

A literature search of conventional bibliographic databases, such as Medline, did not yield any controlled studies useful for our purposes. The Web, on the other hand, provides a plethora of information on all the different types of powered wheelchairs. Most of this information comes from manufacturers but some is provided by wheelchair-user groups and rehabilitation centres. Despite this abundance of information, there are very few well-designed studies comparing the performance of the different types of available wheelchair drives. As a result, we retained only two studies.

The first study, conducted at the University of Pittsburgh, examined five different brands of FWDs, RWDs or MWDs. These brands were selected because they appeared on the list of wheelchairs covered by the U.S. Department of Veterans Affairs. Three types of powered chairs from each brand were tested, that is, 15 wheelchairs purchased from different retailers by an anonymous third party. Tests were performed according to nearly half of the international and American wheelchair standards in effect when the study was published in February 2002. The aim of the study was to check whether these standards could be used to evaluate different types of powered wheelchairs.

The second study was conducted in British Columbia during the winter of 1999–2000 on powered wheelchairs with different types of drives. The aim of the study was to test the performance of these wheelchairs in real winter conditions.

CONCLUSIONS

Although limited, the data we collected provided enough information for us to conclude that MWDs do not seem inferior to other powered wheelchairs. Most of the characteristics of the tested MWDs are equally good and their turning radius is superior, giving them better manoeuvrability in tight spaces. Despite the paucity of data, we can assert that they are reasonably priced.

We were unable to find any specific eligibility requirements for potential users of MWDs. Given the lack of data on the parameters to be considered in prescribing these wheelchairs, the present procedure based on the clinical judgment of health-care practitioners, backed by current multidisciplinary interventions, must remain the method for allocating these wheelchairs.

A final point must be added to our conclusions: Of the 15 FWDs, RWDs or MWDs tested for standards compliance, 9 wheelchairs failed at least 1 test out of the 11 selected for the study (from a total of 23 applicable tests). If, on the one hand, this observation can no doubt be viewed as an *a posteriori* justification for the American lemon laws, on the other hand, it raises questions about the quality of the mobility products currently available in Canada. Nonetheless, in Québec, the contracts between RAMQ and its suppliers are explicit regarding the warranties to be fulfilled and may help counter some of the evident shortcomings.

RECOMMENDATIONS

Given that this review is favourable overall, AETMIS recommends that RAMQ add mid-wheel drive powered wheelchairs to its list of devices that compensate for physical deficiencies, on the same basis as other currently insured powered wheelchairs. Nevertheless, RAMQ must be able to assure itself of the quality of these chairs by means of compliance tests performed on more than one chair of the same brand. The same requirement applies to all types of powered wheelchairs.

Considering the means required to implement this recommendation, it would seem advisable either to provide for both operational and financial partnership or collaborative agreements among all the parties concerned, or to review existing terms and conditions in order to wield greater control over the reliability of the products. Such parties include manufacturers, public or private standards-testing organizations, and public or private payers.

ABBREVIATIONS AND ACRONYMS

AERDPQ	<i>Association des établissements de réadaptation en déficience physique du Québec</i>
AETMIS	<i>Agence d'évaluation des technologies et des modes d'intervention en santé</i>
ANSI	American National Standards Institute
ATA	Assistive Technology Act
CRIQ	<i>Centre de recherche industrielle du Québec</i>
CSA/ACNOR	Canadian Standards Association/Association canadienne de normalisation
DVA	Department of Veterans Affairs
FDA	Food and Drug Administration
FWD	Front-wheel drive powered wheelchair
HERL	Human Engineering Research Laboratories
ISO	International Organization for Standardization/ <i>Organisation internationale de normalisation</i>
MWC	Manual wheelchair
MWD	Mid-wheel drive powered wheelchair
PWC	Powered wheelchair
RAMQ	<i>Régie de l'assurance maladie du Québec</i>
RESNA	Rehabilitation Engineering and Assistive Technology Society of North America
RWD	Rear-wheel drive powered wheelchair
SCC/CCN	Standards Council of Canada/ <i>Conseil canadien des normes</i>
SHRS	School of Health and Rehabilitation Sciences
SOWHAT	Subcommittee on Wheelchairs and Transportation
UP	University of Pittsburgh
WaRT	Wheelchair and Related Technology
WC	Wheelchair