

Current Status of the Utilization of Powered Wheelchair in Preschool Children with Locomotive Disability in Japan

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ABSTRACT. [Purpose] This study aimed to elucidate the actual state of powered wheelchair (PWC) prescription for preschool children with disabilities in Japan, and also to determine the approximate number of preschool children with disabilities who would potentially benefit from PWC use. [Subjects and Methods] A total of 318 facilities providing rehabilitation for disabled children in Japan were enrolled in the study. A questionnaire about PWC use for preschoolers was mailed to the facilities. Each study item was analyzed employing the Fisher's exact test. [Results] Of the 318 facilities, consent to participate in this study was obtained from 108 (return rate: 34.0%). After PWC provision, many facilities reported improvement in quality of life indices for preschool children with disabilities. It was revealed that there were 6 preschool children from 2 to 6 years of age with disabilities who might acquire a means of independent locomotion through PWC provision and thereby experience improved quality of life. [Conclusion] There was no negative comment from the facilities studied about the prescription and provision of PWC for preschool children with disabilities.

Key words: powered wheelchair, preschool children with disabilities, nationwide survey

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For children, acquisition of physical "locomotion" is an important factor in the enhancement of spatial cognition, concept formation, and language development¹. Thus, for children with impaired self-propelled locomotion, a powered wheelchair (PWC) and other devices can be regarded as important welfare equipment for supporting these children in the formation of emotional and social functions^{2,3}.

Given this background, early provision of a PWC as a means of independent locomotion to children with impaired self-propelled locomotion during the preschool period reportedly activates exploratory activities, promotes mental and motor development, expands the range of play activities, and increases opportunities to play roles as children^{2,6}.

However, it has also been reported that the PWC is rarely introduced to preschool children with disabilities^{6,8}.

The reported background reasons for this are that, because PWC use inhibits motor development and acquisition of the ability to walk, therapists and parents regard the PWC as the last resort for children without hope of recovery or even clinical improvement^{3,5}. Furthermore, medical professionals including rehabilitation specialists take a negative attitude toward prescribing a PWC based on safety concerns because these children are very young^{9,11}.

As described above, there is no consensus on PWC application in children at present. In Japan, the Ministry of Health, Labour and Welfare, which provides financial support for people with disabilities to use a PWC, indicates in the Guidelines on Administrative Affairs for the Supply of Powered Wheelchairs as Assistive Devices¹² that the criteria regarding chronological age are school age or older, preferably higher grades of elementary school or above. Simultaneously, in 2010, the ministry issued a statement saying that it is not appropriate to decide against providing this form of support based only on age without any exceptions and to reject applications¹³.

Although these guidelines indicate that eligibility should not be determined only by age, they specify no crite-

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ria on which PWC prescription for children with disabilities should be based. Thus, we analyzed various developmental indicators necessary for determining whether preschool children can safely operate a PWC indoors and revealed that children at a certain minimum developmental age can, in fact, use a PWC indoors¹⁴⁾.

However, no sufficiently extensive survey has been conducted in either Japan or overseas on PWC prescription for preschool children with disabilities on the basis of indicators including developmental age and ability to operate a PWC⁶⁻⁸⁾. Thus, the present study aimed to elucidate the actual state of PWC prescription for preschool children with disabilities in Japan and to determine the approximate number of preschool children with disabilities who would potentially benefit from PWC use, by setting criteria for developmental indicators considered to determine the ability to operate a PWC. On the basis of the results obtained in the study, we propose eligibility criteria applicable to PWC prescription for preschool children with disabilities.

Subjects and Methods

Subjects

From the child welfare facilities reported in the Survey of Social Welfare Facilities by the Statistics and Information Department of the Ministry of Health, Labour and Welfare¹⁵⁾, homes for children with physical difficulties, schools for children with physical difficulties, and facilities for severely mentally and physically handicapped children were selected after homes for mentally retarded children (including homes for autistic children and treatment homes for children with physical disabilities), schools for mentally retarded children, homes for blind children, homes for deaf and mute children, schools for children with hearing difficulties, and short-term therapeutic facilities for emotionally disturbed children had been excluded¹⁶⁻²⁰⁾ (Table 1).

Survey Methods

Letters entitled "A Questionnaire Survey on Prescription of a Powered Wheelchair," explaining the study and requesting participation, were mailed with questionnaire forms and return envelopes. Completed questionnaire forms were to be returned by mail. The questionnaire survey was conducted without collecting personal information, such as affiliations and names of respondents, which would identify individual respondents. It was requested that the questionnaire forms be returned between February 27 and March 25, 2014.

Survey Contents

Because our literature search yielded no prior studies, we prepared an original questionnaire to survey the state of PWC prescription to preschool children with disabilities and related issues to be used in the present study. The major

survey items were as below.

1) Attributes of the facilities

The survey included questions on the professions of respondents to the questionnaire survey, attributes of facilities (region, facility category, and names of the diseases of users), presence or absence of experience in prescribing a PWC, and the professions of those involved in PWC prescription.

2) Common conditions in facilities having experience in prescribing a PWC to preschoolers.

The survey included questions on levels of monitoring PWC use (indoors and outdoors), major means of locomotion prior to prescription (indoors and outdoors), time from the start of practice until application, presence or absence of experience in prescribing a PWC to preschool children with disabilities due to non-progressive disease, changes in gross motor skills (children with disabilities due to non-progressive disease), changes in the ability to operate a PWC (children with disabilities due to non-progressive disease), incidence of accidents, changes in demands of preschool children with disabilities for PWC use, changes in the range of movement, changes in communication skills, and ease of involvement with users.

Questions were asked about the presence or absence of experience in prescribing wheelchairs (e.g., manual wheelchair, PWC, and push-type wheelchair) to preschool children with disabilities during a one-year period from January to December 31, 2013, and the number of prescriptions. Questions were asked about the number of preschool children with disabilities who reached the developmental age specified by the authors for children who were prescribed a wheelchair and other devices during the same period.

Statistical Analyses

The collected data were grand total and analyzed employing the Fisher's exact test to evaluate differences in ratios. The significance level was set at less than 0.05. The statistical package SPSS Ver. 22 was used for all statistical analyses.

Conflicts of Interest and Ethical Consideration

There were no conflicts of interest in this study. In compliance with the Declaration of Helsinki, the objectives of, consent to, and ethical considerations were explained to the head of each facility in written form at the time of the questionnaire survey. Return of a completed questionnaire form was taken to indicate consent to participate in this study. The study contents were approved by the ethics committee of Tottori University Faculty of Medicine in fiscal year 2013 (Approval No. 2370).

Results

The questionnaire survey was mailed to 318 facilities,

Table 1. Facilities responded to the questionnaire survey

Category		Number (%)
Single-function facilities	Schools for children with physical difficulties (1)	13 (12.0)
	Homes for children with physical difficulties (2)	5 (4.6)
	Facilities for severely (mentally and physically) handicapped children (3)	7 (6.5)
Multifunction facilities	Mainly (1) + (2)	19 (17.6)
	Mainly (3) + (1)	39 (36.1)
National Hospital Organization	Wards for children with muscular dystrophy/severe psychosomatic disorders	10 (9.3)
	Others	15 (13.9)
	Unknown	
Responding facilities/Survey targeted facilities		108/318
Response rate		34.0%

Table 2. Occupational category of the respondents (multiple answers allowed)

	No. of Respondents (%)
Medical doctor (MD)	22 (20.0)
Physical therapist (PT)	65 (59.1)
Occupational therapist (OT)	14 (12.7)
Nurse	1 (0.9)
Rehabilitation engineer	1 (0.9)
Others	7 (6.4)
Not specified	1 (0.9)
Total	110 (100.0)

Others: Advisor (3), Childminder (3), Clerical staff (1)

Table 4. Changes in the QOL of children after PWC provision

	Change	No. of Facilities reported (%)
a) Range of independent locomotion	Expanded	22 (96.0)
	Unchanged	1 (4.0)
	Reduced	0 (0)
Total		23 (100)
b) Desire of children to use PWC	Increased	20 (87.0)
	Unchanged	2 (8.7)
	Decreased	0 (0)
	Unknown	1 (4.3)
Total		23 (100)
c) Communication skills	Improved	14 (60.9)
	Unchanged	8 (34.0)
	Impaired	0 (0)
	Unknown	1 (4.3)
Total		23 (100)

Table 3. Major means of locomotion before PWC provision among preschool children with disabilities

<Indoors>	No. of Facilities reported	<Outdoors>	No. of Facilities reported
Means		Means	
Immobile (total assistance)	11	Buggy (push-type wheelchair)	18
Rolling over	6	Manual wheelchair	1
Elbow crawling	1	Walker	1
Moving on the knees	0	Cane	0
Bunny whip	1	Others	0
Crawling on all fours	1	Unknown	3
Walking while holding onto something	1	Total	23
Independent walking	0		
Others	1		
Unknown	1		
Total	23		

of which consent to participate in this study was obtained from 108 (return rate: 34.0%). Of these 108 facilities, 2

were excluded due to not meeting the requirements to return the questionnaire survey within the period specified,

Table 5. Changes in specific communication skills after PWC provision

	No. of Facilities reported (%)
Children became able to express themselves by means of gestures.	8 (26.7)
Children started approaching others.	7 (23.3)
Children started speaking more often.	5 (16.7)
Children increased their demands on others.	5 (16.7)
Children started looking at others.	3 (10.0)
Children became able to understand spoken words.	0 (0)
Children became able to understand gestures.	0 (0)
Others	2 (6.7)
Total	30 (100)

multiple answers allowed

Table 6. Changes in motor skills after PWC provision among children with non-progressive diseases

	Change	No. of Facilities reported (%)
Ability to operate the wheelchair	Improved	11 (84.6)
	Unchanged	1 (6.8)
	Reduced	0 (0)
	Unanswered	1 (6.8)
Total		13 (100)*
Gross motor skills	Improved	3 (23.1)
	Unchanged	9 (69.2)
	Reduced	0 (0)
	Unanswered	1 (7.7)
Total		13 (100)*

*: Responses from 13/23 facilities with experience in PWC prescription to preschool children with disabilities due to non-progressive disease

Table 7. Accidents during PWC use among preschool children with disabilities

a) Accidents during PWC use		b) Specific details of the accidents	
Accidents	No. of Facilities reported (%)	Details of accidents	No. of Facilities reported (%)
Present	7 (30.0)	Collision with a car	0 (0)
Absent	14 (61.0)	Collision with a bike	0 (0)
Unknown	2 (9.0)	Collision with a bicycle	0 (0)
Total	23 (100)	Collisions with indoor obstacles	2 (18.2)
		Collisions with outdoor obstacles	1 (9.1)
		Collisions with people	1 (9.1)
		Falls from the wheelchair	3 (27.3)
		Falls from uneven surfaces	2 (18.2)
		Running into a ditch on a public road	1 (9.1)
		Others	1 (9.1)
		Total	11 (100)

multiple answers allowed

Table 8. Relationship between Children's desire to use PWC and Accident during PWC use.

		No. of Facilities experienced Accidents during PWC use		
		Present*	Absent*	Total
Desire of children to use PWC	Increased	6	15	21
	Unchanged	1	1	2
		7	16	23

*: p=0.53 by the Fisher's exact test.

and 106 facilities were thus included in the analyses.

1) Attributes of the Facilities

The categories of the facilities are shown in Table 1.

Regarding the professions of the respondents who completed the questionnaire survey, physical therapists accounted for 59.1%, medical doctor for 20.0%, occupational therapists for 12.7%, and others for 8.2% (Table 2).

2) Common Conditions in Facilities Having Experience in Prescribing a PWC to Preschoolers.

There were 23 facilities (21.7%) in which PWCs had been prescribed to preschool children with disabilities.

Before provision of wheelchairs and other devices, many preschool children with disabilities had been using a push-type wheelchair (Table 3). Answers to the question regarding the time from the start of practicing PWC use until application for delivery of a PWC were obtained from 23 facilities. The most common practice period was between 6 months and less than 1 year, and the period was less than 1

Table 9. Modes of assisted locomotion among preschool children with various types of diseases

Classification	No. of preschool children in 2013 with device-assisted locomotion (with qualified developmental stages)		
	Push-type wheelchair (including buggy)	PWC (joy stick/power button)	Manual wheelchair (including assist type)
Cerebral disease (including cerebral palsy)	18 (1)	1 (0)	20 (6)
Spondyloschisis	7 (1)	0 (0)	9 (8)
Neuromuscular disease (including muscular dystrophy)	8 (3)	3 (2)	9 (6)
Osteopathy/arthropathy	2 (0)	0 (0)	4 (0)
Others*	15 (1)	1 (0)	5 (0)
Total	50 (6)	5 (2)	47 (20)

Numbers are actual numbers of prescriptions of each type of wheelchair in the facilities studied from January 1 to December 31, 2013.

Numbers in parentheses represent numbers of children determined to be at the developmental age or older at which they could operate PWC indoors by themselves. Qualification criteria to drive PWC indoors are the following 3 requirements (Uyama et al).

- 1) Ability to understand language equivalently to that of children ≥ 30 months
- 2) Visuoperceptual ability equivalent to that of children ≥ 42 months
- 3) Fine motor skills equivalent to those of children ≥ 15 months

Among 50 children prescribed push-type wheelchair during the target period, 6 children could have operated PWC by themselves.

*: epidermolysis bullosa hereditaria, multiple arthrogyposis and Klippel-Trenaunay-Weber syndrome

year in 60% of the facilities.

After PWC provision, the answers to the question regarding changes in quality of life (QOL) for preschool children with disabilities were “the range of independent locomotion was expanded” in 96.0% of the facilities, “the demands of children for PWC use were increased” in 87.0%, and “the communication skills were improved” in 60.9% (Table 4). In descending order, the changes in specific communication skills were “children became able to express themselves by means of gestures” in 26.7%, “children started approaching others” in 23.3%, “children started speaking more often” in 16.7%, and “children increased their demands on others” in 16.7% (Table 5).

There were 13 facilities in which PWCs had been prescribed to preschool children with disabilities due to non-progressive disease. The ability to operate a PWC after provision was “improved” in 84.6% and remained “unchanged” in 6.8%, whereas gross motor skills were “improved” in 23.1% and remained “unchanged” in 69.2% (Table 6).

Accidents during PWC use occurred in 7 facilities. The common accidents were falls from a wheelchair, collisions with indoor obstacles, and falls from uneven surfaces (Table 7).

There was no significant increase in the number of facilities that have experienced an accident during PWC use despite increased demands by children to have more time to use PWC in some facilities ($p=0.53$, Table 8).

3) The Number of PWC Prescriptions for Preschool Children and the Number of Children Able to Use a PWC

During the survey period, wheelchairs and other devices were prescribed to 102 children. Among them, 6 of 50 children who were prescribed a push-type wheelchair met the criterion for developmental age at which children were considered to be able to safely operate a PWC indoors (Table 9).

Discussion

PWC Efficacy and Safety

Provision of a PWC, which can serve as a means of independent locomotion, to disabled preschool children with impaired independence in locomotion was effective for improving communication skills, expanding ranges of movement, and so forth, as described in several earlier reports²⁻⁶. By repeating a process comprising motivation, action, goal achievement, and satisfaction, children frequently experience senses of satisfaction and achievement. This experience promotes subsequent development. Simultaneously, for children, acquisition of independent locomotion means acquisition of an ability to go whenever and wherever they want, and this ability leads children with disabilities to experience both self-selection and self-decision. In our view, a PWC can provide children with numerous opportunities to form the basis for such crucial experiences²⁹.

Meanwhile, although there are concerns about declining motor function due to PWC use and about safety^{3,5},

there was no answer from the facilities studied stating decreased motor skills following PWC provision in the children they cared. In addition, because the increase in the frequency of PWC use and the incidence of accidents were not significantly associated, it seems that being preschool age with disabilities does not support the simple conclusion that PWC use results in impaired gross motor skills, or that PWC operation by children is unsafe as they lack sufficient skill.

These findings indicate that PWC use is beneficial for preschool children with disabilities in terms of both psychosocial and physical development.

Children Eligible for PWC Prescription

The results of this survey revealed that some children with disabilities were prescribed with a push-type wheelchair despite being able to operate a PWC. There were 6 preschool children from 2 to 6 years of age with disabilities who might acquire a means of independent locomotion through PWC provision and thereby experience improved QOL.

Guerette et al⁷⁾ indicated that there are 4 factors inhibiting PWC provision to preschool children with disabilities, that is, cognitive, physical, behavioral, and family-living environment factors. Because 6 children with disabilities had reached a developmental stage at which they could operate a PWC, the factors that inhibited PWC prescription may not directly involve the children themselves. Instead, possible factors are family-living environment factors, such as “parents do not recognize the need for a PWC” and “there is not enough space to use a PWC,” or factors inhibiting therapists from recommending or parental preference for a PWC, such as “gross motor skills can be improved by treatment,” as reported by Wiart³⁾.

On the other hand, the common diseases observed in children prescribed a PWC were neuromuscular disorders including muscular dystrophy. While these chronic diseases are characterized by loss of motor function due to muscular weakness, the cognitive function of children with neuromuscular diseases, such as spinal muscular atrophy (SMA), are within the normal range. These children are considered to have average intelligence, with only a few being mentally retarded²¹⁻²⁴⁾. Thus, acquisition of a means of independent locomotion is regarded as important in situations requiring collective actions, such as exploration, playing, and activities at nursery school, and this might have contributed to the large number of PWC prescriptions. In addition, Sally et al reported that children less than 2 years of age with SMA can adequately operate a PWC²³⁾. SMA is suggested to be the most suitable disease for prescribing a PWC to preschool children with disabilities.

Proposal for PWC Prescription for Preschool Children with Disabilities

PWCs were shown to be effective at the facilities in which PWCs had been prescribed. However, the number of these prescriptions is limited nationwide, and there are many children using a push-type wheelchair despite being able to operate a PWC. For children to fully demonstrate their inherent capabilities and to achieve appropriate psychosomatic development, necessary support should be provided.

From this viewpoint, we advocate that efforts be made to eliminate social obstacles to PWC prescription for preschool children with disabilities. To achieve this objective, it is important to select appropriate children with disabilities who are eligible for PWC prescription according to the criteria proposed by the authors for PWC prescription for preschool children with disabilities and other criteria, instead of those based simply on age. This approach may lead to the development of a consensus among family members, care givers, medical facilities, and administrative agencies regarding the promotion of PWC use by preschool children.

Limitations

There are several limitations in the study. Firstly, the recovery rate of this survey was 34.0%. The comparatively low rate gives rise to a possibility that some variables not handled in the study might have affected the results. Secondly, there might have been a sampling bias, by which certain facilities enthusiastic for childhood PWC prescription responded promptly to the questionnaire leading to skew the results.

Accordingly, an improvement of recovery rate could be of importance to increase the accuracy of the study.

Conclusion

Focusing on the developmental ages of preschool children with disabilities, it was found that there were 6 children who could reasonably be expected to acquire a means of independent locomotion through PWC provision in this study.

There was no negative comment from the facilities studied about the prescription and provision of PWC for preschool children with disabilities.

Acknowledgment

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APPENDIX: Questionnaire Format of "A Questionnaire Survey on Prescription of a Powered Wheelchair"

• **What is the occupation of the person answering this questionnaire? (Circle the appropriate number)**

- 5 ①Medical doctor ②Physical therapist ③Occupational therapist ④Speech therapist ⑤Rehabilitation engineer ⑥Nurse ⑦Advisor ⑧Counseling staff ⑨Childminder ⑩Clerical staff ⑪Other()

• **The following questions concern the type of the facilities.**

(Circle the most appropriate answer or provide comments as needed)

What is the type of the facility you belong?

- 10 *Note: Multifunction facilities are those with multiple departments such as for enrollment, visitors, and children with severe mental and physical disabilities (e.g., hospital ward for children with severe mental and physical disabilities, department for visiting patients, etc.)

①Homes for children with physical difficulties(Single-function facilities)

②Schools for children with physical difficulties(Single-function facilities)

- 15 ③Facilities for severely mentally and physically handicapped children(Single-function facilities)

④Homes for children with physical difficulties(Multifunction facilities)

⑤Schools for children with physical difficulties(Multifunction facilities)

⑥Facilities for severely mentally and physically handicapped children(Multifunction facilities)

⑦Homes for children with physical difficulties and Schools for children with physical

- 20 difficulties(Multifunction facilities)

⑧Homes for children with physical difficulties and Facilities for severely mentally and physically handicapped children(Multifunction facilities)

⑨Schools for children with physical difficulties and Homes for children with physical difficulties and Facilities for severely mentally and physically handicapped children(Multifunction facilities)

- 25 ⑩National Hospital Organization (Wards for children with muscular dystrophy)

⑪National Hospital Organization (Wards for children with severe psychosomatic disorders)

⑫Others()

• **The following questions concern the provision of powered wheelchairs at your facilities.**

(Circle all that are applicable or provide comments as needed)

- 30 1. Has a powered wheelchair been prescribed at your institutions to date?

Present • Absent

2. In prescribing a powered wheelchair, who is/are mainly involved in the specifications and settings of the wheelchair? (Choose a maximum of 3 from the options below)

①Physical therapist ②Occupational therapist ③Speech therapist ④Medical doctor ⑤Providers

- 35 ⑥Rehabilitation engineer ⑦Nurse ⑧Counseling staff ⑨social worker ⑩Advisor ⑪Others()

3. Were powered wheelchairs or wheelchairs (including buggies) prescribed at your facilities **during the period between January and December 2013?**

Present • Absent

4. To how many preschool age children with disabilities were powered wheelchairs or wheelchairs prescribed at your facilities during the period between January and December 2013? Please describe the numbers by disease and the types of wheelchairs.

***Note: Describe the numbers of children by type and disease in the table below.**

	Push-type wheelchair (including buggy)	Manual wheelchair (including assist type)	Powered wheelchair (joy stick/power button)
Cerebral palsy			
Spina bifida			
Muscular dystrophy			
Neuromuscular disease (Excluding Muscular dystrophy)			
Bone or joint disease			
Central paralysis (Excluding Cerebral palsy)			
Other(Details)			

5 [Only for those who replied to question 4 above]

5. Please tell us the numbers of children satisfying all of the following conditions for each reply to question 4.

10

- | |
|---|
| ① Ability to understand language equivalent to that of children ≥ 30 months
② Visuoperceptual ability equivalent to that of children ≥ 42 months
③ Fine motor skills equivalent to those of children ≥ 15 months |
|---|

***Note: Describe the numbers of children by type and disease in the table below.**

	Push-type wheelchair (including buggy)	Manual wheelchair (including assist type)	Powered wheelchair (joy stick/power button)
Cerebral palsy			
Spina bifida			
Muscular dystrophy			
Neuromuscular disease (Excluding Muscular dystrophy)			
Bone or joint disease			
Central paralysis (Excluding Cerebral palsy)			
Other(Details)			

6. Have you prescribed powered wheelchairs to preschool age children with disabilities outside of the period between January and December 2013 at your facilities?

Present • Absent

● **The following question is for the responsible individual at the facilities where powered wheelchairs were prescribed to preschool age children with disabilities. Provide answers stating common condition of the facility you belong.**

7. At what monitoring level do you prescribe powered wheelchairs to preschool age children with disabilities at your facilities? **Please reply for both indoor and outdoor use.**

Indoor: Full-time monitoring (verbal instruction + minor assistance) • Partial monitoring (verbal instruction) • No monitoring

Outdoor: Full-time monitoring (verbal instruction + minor assistance) • Partial monitoring (verbal instruction) • No monitoring • Outdoor use is not assumed

8. What is the level of mobility capabilities before PWC use for preschool age children with disabilities to whom powered wheelchairs are prescribed? Select **the most applicable answer for outdoor and indoor use.** (Choose one for each)

Outdoor: ①Buggy (push-type wheelchair) ②Manual wheelchair ③walker ④ cane ⑤Other ()

Indoor: ①Immobile (total assistance) ②Rolling over ③Elbow crawling ④Move on the knees ⑤Bunny whip ⑥Crawling on all fours ⑦Walking while holding onto something ⑧Independent walking ⑨Other ()

9. What is the period required after the start of practice using a powered wheelchair until application at your facilities?

①Less than one month ②From 1 to less than 3 months ③From 3 to less than 6 months ④From 6 to less than 12 months ⑤From 12 to less 18months ⑥From 18 to less 24months ⑦From 24 to less 30months ⑧From 30 to less 36 months ⑨Others ()

10. Have you ever prescribed powered wheelchairs to preschool age children with disabilities associated with non-progressive disease, i.e. with the exclusion of progressive diseases that reduce gross motor capabilities such as muscular dystrophy, at your facilities?

Present • Absent

11. Have there been any changes in the ability to operate powered wheelchairs after children with disabilities associated with non-progressive disease were supplied with such wheelchairs?

Improved • Unchanged • Impaired

12. Have there been any changes in gross motor capabilities after children with disabilities associated with non-progressive disease started using a powered wheelchair?

Improved • Unchanged • Impaired

13. Have there been any changes in the desire to use a powered wheelchair in the children themselves?

Increased • Unchanged • Decreased

14. Has the travel range of the children changed with the use of a powered wheelchair?

Expanded • Unchanged • Reduced

15. Have there been any accidents in which children have injured themselves or others during the operation of powered wheelchairs?

Present • Absent • Unknown

16. Specific details of accidents (multiple answers allowed)

①Collision with a car ②Collision with a bike ③Collision with a bicycle ④Collisions with outdoor obstacles ⑤Collisions with indoor obstacles ⑥Collisions with people ⑦Falls from the wheelchair ⑧Falls from uneven surfaces ⑨Running into a ditch on a public road ⑩Others()

17. Did the use of powered wheelchairs result in changes in the communication abilities of the children?

Improved • Unchanged • Impaired

[Only for those who replied "Improved" to 17]

18. Changes in specific communication skills (multiple answers allowed)

①Children started speaking more often. ②Children increased their demands on others.
 ③Children started approaching others. ④Children started looking at others.
 ⑤Children became able to understand spoken words. ⑥Children became able to understand gestures.
 ⑦Children became able to express themselves by means of gestures.
 ⑧Children became able to change in facial expression. ⑨Other ()

[Only for those who replied "Improved" to 18]

19. Did the changes in question 17 lead to a change in the ease of people around the children becoming involved?

Became easier • Unchanged • Became more difficult