

ORIGINAL ARTICLE

MAKING OF A “MANUAL TO SUPPORT DRIVING RESUMPTION OF THE STROKE SURVIVORS (AOMORI-VERSION)” TO START THEIR SUPPORT AND INVESTIGATION OF ITS USE

Tsukaki Narita¹⁾, Mihoko Noda²⁾, Kenichi Fujiwara¹⁾, Takao Osanai²⁾, and Takuhiko Kato²⁾

Abstract We made a “Manual to support driving resumption of the stroke survivors (Aomori-version)” (the manual), and investigated its use for 7 months with targeted occupational therapists (OTs) in Aomori Prefecture. Seventy-seven OTs participated in the investigation. Six among the 77 OTs used the manual. The number of stroke survivors supported for driving resumption by these 6 OTs increased 11.2-fold after providing the manual, and these OTs answered that the manual was useful. Thirty-three among 71 OTs who didn't use the manual reported that they were not in the circumstance to use it, and 38 OTs did not deal with the driving support although they treat the stroke survivors. Approximately 90% of them stated, “I would like to use it if I had a chance.” Most of the comments from the OTs are affirmative, although there were some negative ones. From these results, it was suggested that the usefulness of the manual regarding the easiness to start support of driving resumption for the stroke survivors, although the number of OT was small. We think this manual has a generality for use all over Japan in spite of being an Aomori-version.

Hirosaki Med. J. 67 : 39—51, 2016

Key words: stroke survivor; driving resumption; manual; occupational therapist; Aomori Prefecture.

Introduction

We conducted a study of 14 stroke survivors in Aomori Prefecture who had resumed driving despite sequelae of hemiplegia after stroke onset; they actually continued to drive a car with one hand¹⁾. The study indicated that the possibility of resuming driving is high in the stroke survivors who can walk independently and perform activities of daily living (ADL) mostly independently without marked cognitive dysfunction even with severe motor paralysis or sensory impairment. The advantages of resuming driving included “I can act freely by myself,” and “It is good for stress release.” The level of daily life satisfaction was significantly higher for “present situation with driving capability” than “hypothetical situation without

driving capability”. However, there was almost no involvement of medical staffs in their driving resumption; the stroke survivors and their family wished to receive support from medical staffs to resume driving smoothly^{1, 2)}.

People providing rehabilitation support should develop tasks to assist the stroke survivors who become unable to drive; such tasks include fully accepting their inconvenience and disappointment, providing guidance to continue to drive safely, and examining alternative measures to driving in case they are unable to drive. In particular, occupational therapists (hereinafter called “OTs”), whose treatment aim is independent daily living of people with disabilities, need to take the lead in responding to the needs of the stroke survivors for resuming driving. However, unlike people

¹⁾ Hirosaki University of Health and Welfare

²⁾ Hirosaki University Graduate School of Health Sciences

Correspondence: T. Narita

Received for publication, January 19, 2016

Accepted for publication, January 22, 2016

with spinal cord injury, the stroke survivors have brain damage and there are no judgement criteria for driving³⁾. Therefore, driving is often prematurely determined dangerous in general; the stroke survivors themselves also do not dare drive because of fear⁴⁾. Accordingly, it is difficult for OTs to provide support even to the stroke survivors who are highly likely to be able to resume driving. Cars are often used as a mode of transportation in provincial areas like Aomori Prefecture where public transportation such as railways and buses are not fully in place. Therefore, it is presumed there are high rehabilitation needs for the stroke survivors to resume driving in Aomori Prefecture. Moreover, there is no hospital or rehabilitation center in Aomori Prefecture that can play a central role in support of resuming driving and a support system, as well as the recognition of its necessity, for the stroke survivors at hospitals in Aomori Prefecture is insufficient. Therefore, it seems that many OTs in Aomori Prefecture are bewildered with how to respond to the need of driving resumption in the stroke survivors⁵⁾.

In this study, we made a “Manual to support driving resumption of the stroke survivors (Aomori-version)” (hereinafter called “the manual”) for easier support to the stroke survivors by OTs in Aomori Prefecture; we then investigated its use and its usefulness. The support in this research, however, means the comprehensive support including not only the support of driving resumption in a narrow sense but also the prevention of the dangerous driving resumption and the consideration of the alternative means when the driving is not permitted.

Outline of this study

This study was performed in two steps: the making of the manual in step I and the survey of manual use in step II. A questionnaire survey

was conducted at each step. A questionnaire survey at step I was conducted in December, 2013 in order to confirm the validity of the contents of a draft manual. A questionnaire survey at step II was conducted in November, 2014 in order to confirm the usefulness of the manual from the manual use during 7 months from beginning of April, 2014 to the end of October, 2014.

The subjects of these questionnaire surveys were 662 OTs on the roster of FY2013 Association of Occupational Therapists in Aomori Prefecture. Of those, 358 OTs worked in the physical disorders field (physical field), 115 OTs in the mental disorders field (mental field), 158 OTs in the geriatric stage disorders field (geriatric field), four OTs in the developmental stage disorders field (development field), and 27 OTs in the education field. Although the fields related to the stroke survivors are primarily the physical field and the geriatric field, we surveyed OTs in all fields to collect opinions broadly.

This study was conducted with the approval of the ethics committee of Hirosaki University Graduate School of Medicine (Reference No. 2013-184). Subjects consented to participation in this study when they sent back their response to the questionnaire.

Step I : Making of the manual

I. Making of the draft manual

The literatures in the online database of ICHUSHI-Web and PubMed during 1980-2013 were searched for using keywords of “stroke”, “driving” and “high-level brain function” to collect references for the making of the draft manual. Then the literatures describing about assessment, training, and support for the driving resumption of the stroke survivors were picked out.

In addition, several scientific journals

related to occupational therapy, rehabilitation and higher brain function were viewed and necessary literatures and materials were collected. Moreover, the information related to the driving in the prefecture were searched for by Internet, and then information related to driving resumption of the stroke survivors were gathered by phone or by direct visit inquiries at the places of driving school, driver's license center, police station and the welfare department of the town and village. In addition, the information of the law system related to cars such as Road Traffic Law was collected. Furthermore, the information from the stroke survivors resuming driving and their family and OTs having support experiences of driving resumption for the stroke survivors was referred. Eighteen reference literatures and materials^{3, 7-23)} were used mainly in order to make the draft manual / the manual. In making the draft manual, to arrange clinically easy to use and simple check sheets and to provide correct car-related information were considered as the essential themes. Classification and arrangement of the data to decide the structure, items, and contents of the draft manual were performed by 5 authors in educational field.

II. Structure of the draft manual

The draft manual consists of Part I "Response to the stroke survivors consulting about resuming driving" and Part II "Information necessary for the stroke survivors to resume driving". Part I provides 4 items of check sheet; the "check sheet A to collect information of the subjects", the "check sheet B to provide driving-related information", the "check sheet C to assess physical function", and the "check sheet D to assess cognitive function". Thirty-three check contents are included totally in these 4 check sheets. Furthermore, Part I provides 1 item of the "rehabilitation program for driving resumption (example)" (hereinafter

called "program example") which were selected from several literatures^{3, 7-9)} relating to the training. Part II provides 8 items of information; the "physical function required for driving"¹¹⁾, the "mental function required for driving"¹²⁻²⁰⁾, the "viewpoint of a fit (relapse)"¹²⁾, the "driver's license system"¹⁰⁾, the "driving aptitude consultation and aptitude test"¹¹⁾, the "purchase and installation of driving auxiliary equipment", the "primary taxation systems and subsidy systems of the government and municipalities"²¹⁻²³⁾, and the "facilities and services available at driving schools".

III. The questionnaire method of the draft manual

A questionnaire survey of the draft manual was conducted using unsigned mailing method about "the necessity" of 33 check contents in 4 items of check sheet and "the sufficiency" of 1 item of program example and 8 items of information. Regarding "the necessity", subjects were asked to mark on the check contents listed of which they thought necessary. Regarding "the sufficiency", subjects were asked to select 1 choice from 3 choices of "sufficient, insufficient, don't know". In addition, subjects were asked to make comments freely in order to collect their opinions on the draft manual. Criterion of the adoption for each check content was that majority of valid respondents (more than 70%) answered it "necessary". Then, criterion of the adoption for program example and each information was that majority of valid respondents (more than 70%) answered it "sufficient".

IV. Results & Discussion

One hundred-fifty-four OTs responded to the questionnaire survey of the draft manual. One hundred-fifty OTs except 4 with some defects in writing were decided to be the valid respondents, who became objects of analysis. The results were shown in Table 1, Table 2, and Table 3.

Table 1. The percentage of OTs who answered that the check content of the draft manual was necessary, and the check content of the manual

Check sheet A : Check content (10) of draft manual	Check sheet A : Check content (10) of the manual
1) Type of driver's license (83%)	1) Type of driver's license
2) Expiration date of driver's license (71%)	2) Expiration date of driver's license
3) History of driving before stroke (83%)	3) History of driving before stroke
4) Type of car the patient drove before stroke (70%)	4) Type of car the patient drove before stroke
5) Purpose of driving before stroke (81%)	5) Purpose of driving before stroke
6) Frequency of driving before (94%)	6) Frequency of driving before
7) Reason for resuming driving (94%)	7) Reason for resuming driving
8) Effect on daily life when driving cannot be resumed (87%)	8) Effect on daily life when driving cannot be resumed
9) Availability of alternative means when driving cannot be resumed (85%)	9) Availability of alternative means when driving cannot be resumed
10) Feelings and thoughts of patient's family toward resuming driving (85%)	10) Feelings and thoughts of patient's family toward resuming driving
Check sheet B : Check content (8) of the draft manual	Check sheet B : Check content (6) of the manual
1) Physical functions required for driving (97%)	1) Driver's license system*
2) Cognitive functions required for driving (96%)	2) Driving aptitude consultation and aptitude test*
3) Viewpoint of a fit (relapse) (87%)	3) Mental and physical functions required for driving *
4) Driver's license system (76%)	4) Knowledge of car modifications
5) Driving aptitude consultation and aptitude test (87%)	-Purchase and attachment of driving auxiliary equipment-
6) Purchase and attachment of driving auxiliary equipment (87%)	5) Primary taxation systems and subsidy systems of the government and municipalities
7) Primary taxation systems and subsidy systems of the government and municipalities (80%)	6) Facilities and services available at driving schools
8) Facilities and services available at driving schools (78%)	
Check sheet C : Check content (8) of the draft manual	Check sheet C : Check content (8) of the manual
1) Visual acuity (97%)	1) Visual acuity
2) Visual field (97%)	2) Visual field
3) Chromatic discrimination capacity (87%)	3) Chromatic discrimination capacity
4) Hearing acuity (90%)	4) Hearing acuity
5) Setting position posture maintenance capability (93%)	5) Setting position maintenance capability
6) Ambulatory ability (70%)	6) Mobility capability*
7) Operation capability (99%)	7) Upper and lower extremity capacity*
8) ADL (38%)	8) ADL
Check sheet D : Check content (7) of the draft manual	Check sheet D : Check content (7) of the manual
1) Attention (96%)	1) Attention
2) Memory (87%)	2) Memory
3) Executive function (90%)	3) Executive function
4) Visuospatial cognitive capacity (95%)	4) Visuospatial cognitive capacity
5) Aphasia (71%)	5) Aphasia
6) Apraxia (92%)	6) Apraxia
7) Cognitive capacity (95%)	7) Cognitive capacity*

The number in parentheses at the end of the check content in the draft manual indicates the percentage of OTs who answered it necessary.

*: It shows that there were amendment or order in the name or turn of the content of information in the draft manual

Check contents of which more than 70% of valid respondents answered as necessary were 32 except "ADL" among 33. The rate of the "ADL" stayed at 38%. There was no comment about this. Regarding the program example and information, the valid respondents who choose "sufficient" were more than 70% except approximately 1/3 of the valid respondents who choose the choice "don't know". There

were 160 comments, which were sorted with similar contents into 3 categories of "expression amendment", "request of additional information" and "opinion, impression or question".

From these results, it was thought that the content validity of the draft manual was confirmed in general because the majority of OTs accepted "the necessity" of the check contents and "the sufficiency" of the program

Table 2. The contents of rehabilitation program (example)

1) Physical function		program (example)	
• Program to the whole body	improvement endurance		
• Motion required in addition to operation of driving	approach on a car seating position maintenance	open and close the door attachment and detachment a seat belt	getting on and off the car
• Training of upper-limbs function required for driving	operation of steering wheel operation of wiper	operation of gear shift operation of each switch	operation of indicator
• Training of lower-limbs function required for driving	operation of pedal	step on or release	exercise of ankles
2) Cognitive function		program (example)	
• Improvement of function and recovery of the brain	delete exercise	calculation subject	memorization subject
• Improvement of the executive function	each craft (woodwork, papercraft)		
• Training for corresponding to trouble when driving	we set up an imitation scene and prepared for the correspondence in an emergency		

Seventy six % of the respondents answered that the content of the example program of the draft manual were enough

Table 3. The ratio of the respondents who answered the contents of information as "sufficient"

Contents of information required for driving resumption : the draft manual (8)	Contents of information required for driving resumption : the manual (6)
1) Physical functions required for driving (97%)	1) Driver's license system *
2) Cognitive functions required for driving (96%)	2) Driving aptitude consultation and aptitude test *
3) Viewpoint of a fit (relapse) (87%)	3) Mental and physical functions required for driving *
4) Driver's license system (76%)	4) Knowledge of car modifications
5) Driving aptitude consultation and aptitude test (87%)	-Purchase and attachment of driving auxiliary equipment-
6) Purchase and attachment of driving auxiliary equipment (87%)	5) Primary taxation systems and subsidy systems of the government and municipalities
7) Primary taxation systems and subsidy systems of the government and municipalities (80%)	6) Facilities and services available at driving schools
8) Facilities and services available at driving schools (78%)	

The number in parentheses at the end of information item indicates the percentage of OTs who answered it "sufficient".

*: It shows that there were amendment or order in the name or turn of the content of information in the draft manual

example and each information item of the draft manual. Although "ADL" was not recognized as a necessary check content by the majority of OTs, the authors deliberated on it and decided to adopt it because there was no negative comments about it and its necessity is shown by literature²⁴⁾ and it was thought as the synthetic index of the mind-and-body function. Moreover, 8 items of the information were rearranged into 6 items of the information and the order of the presentation was changed in accordance with a suggestion from the respondents (Table 3). Additionally, 38 cases of expression amendment were performed such as "walking ability" into "ambulatory ability", or "operation capability"

into "function of upper and lower extremity". And 11 cases of additional information insertion such as a reference data of Road Traffic Law were performed. We summarized opinions, impressions and questions by similar contents, and made an answer sheet relevant to 16 questions, which we sent to the subjects later with the completed manual.

Step II : Survey about the manual use

I. Survey method of the manual use

In April 2014, the completed manual was sent to the subjects; and also the use of the manual for seven months from the beginning of

Table 4. Support of six OTs who used the manual for the stroke survivors' resuming driving

OT	Sex	Years of OT experience	After the manual distribution				Before the manual distribution			
			cases consulted	cases OT proposed	cases in total	cases per year	cases consulted	cases OT proposed	cases in total	※cases per year
A	M	2	3	3	6	10.2	2	3	5	5.0
B	F	4	2	0	2	3.4	0	0	0	0.0
C	F	5	1	0	1	1.7	4	0	4	1.0
D	M	5	1	1	2	2.4	1	0	1	0.3
E	M	9	2	2	4	6.8	3	1	4	0.5
F	M	11	3	0	3	5.1	1	0	1	0.1
Total/[Median]			12	6	18	[4.25]*	11	4	15	[0.38]

After the manual distribution: from April to October, 2014 (seven months)

Before the manual distribution: before November 2013

cases consulted: the number of the stroke survivors from whom OT was consulted about driving resumption

cases proposed: the number of the stroke survivors to whom OT proposed about driving resumption

cases in total: cases in consulted + cases OT proposed

cases per year: the number of the stroke survivors converted into per year to compare relatively before and after the manual distribution

※Cases per year before the manual distribution were obtained by subtracting one year from the years of OT experience.

*: $p < 0.05$ (Wilcoxon signed rank test)

April to the end of October 2014 (hereinafter called “after the manual distribution”) was requested by the enclosed document. However, it was informed in writing that the manual use was completely left to each OT's free will and was not mandatory. In November of the same year, the questionnaire survey was conducted to investigate the manual use using unsigned mailing method. The contents of the questionnaire were about “use or not use of the manual”, “the number of cases” to whom support using the manual was offered, and “easy to use”, “useful” of the manual. The question for OT who did not use the manual was about “whether you wish to use the manual if you had an opportunity in a future.” We also investigated the number of cases to whom they offered support before November, 2013 (hereinafter called “before the manual distribution”) for comparison. Furthermore, free column was set at each item, and comments were collected.

For statistical analysis, Wilcoxon signed rank test was used for the data with correspondence and the exact binomial test was used for frequency distribution, using SPSS 17.0 (Windows' version). The level of significance

was set at 5%.

II. Results

1. Respondents

In the questionnaire survey of the manual use, 77 OTs responded. Of the 77 respondents, 6 OTs used the manual after the manual distribution; the mean OT experience of them was 6.0 ± 3.3 years; they were all in the physical field. Meanwhile, 71 OTs did not use the manual; the mean OT experience of them was 12.8 ± 8.0 years; 32 OTs were in the physical field, 9 OTs were in the mental field, 19 OTs were in the geriatric field, one OT was in the developmental field, and 10 OTs were in the education field.

2. Support of 6 OTs who used the manual (Table 4)

Six OTs who used the manual provided support to 18 cases after the manual distribution (support responded to consultation: 12 cases, support proposed by OT: 6 cases). Meanwhile, support was provided to 15 cases before the manual distribution (support responded to consultation: 11 cases, support proposed by OT: 4 cases). Cases increased in number after the manual distribution. Especially the number

Table 5. Answer to the questions regarding the 11 items from six OTs who used the manual

11 items of the manual	OTs who used the manual	OTs who chose "easy to use"	OTs who chose "usefulness"
1) Check sheet A to collect information of the subjects	3 (5)	3	3
2) Check sheet B to provide driving-related information	4 (9)	2 #	4
3) Check sheet C to assess physical function	3 (5)	3	2 #
4) Check sheet D to assess cognitive function	4 (5)	1 #	2 #
5) Rehabilitation program for resuming driving (example)	3 (5)	—	2 #
6) Driver's license system	4 (9)	—	4
7) Driving aptitude consultation and aptitude test	3 (6)	—	3
8) Mental and physical function required for driving	2 (3)	—	2
9) Knowledge of car modification -Purchase & attachment of driving auxiliary equipment-	0 (0)	—	0
10) Primary taxation systems and subsidy systems of the government & municipalities	1 (1)	—	1
11) Facilities and services available at driving schools	2 (1)	—	2

The numbers in parentheses show the number of the stroke survivors to whom each item was applied.

"ease to use" was asked about check sheets only.

#: This tag indicates the presence of OTs who did not select the choice of "easy to use" or "usefulness".

of case to whom support was proposed by OT increased from 4 to 6 and the number of case increased from zero to 2 in OT "B." However, the number of supported case can't be compared simply because there is a difference in the investigation period before and after the manual distribution in this survey. Therefore we converted the number of supported case into per year (hereinafter called, "cases per year") and compared relatively before and after the manual distribution. For the calculation of the cases per year before the manual distribution, we used the value subtracted by 1 year from the years of experience of each OT (to remove 1 year from November, 2014 to December, 2013).

The median of the cases per year was 4.25 [interquartile range, 2.98 to 7.65] after the manual distribution and 0.38 [interquartile range, 0.08 to 2.00] before the manual distribution, with showing an 11.2-fold increase after the manual distribution. The numbers of the cases per year between before and after the manual distribution showed a significant difference ($p = 0.028$) by Wilcoxon signed rank test.

3. Answer to the questions regarding 11 items from 6 OTs who used the manual (Table 5)

Two or three OTs did not select the choice "easy to use" to the questions regarding check sheet B to provide driving-related information and check sheet D to assess cognitive function, which are items tagged with # among the 11 items of the manual. There was a comment that "it was difficult to perform all of them," regarding check sheet D. One or two OTs did not select the choice "useful" to the questions regarding check sheet C to assess physical function, check sheet D to assess cognitive function, and the program example. There were comments "the test tools are not available" and "anxious about whether tabletop exercises can be applied to actual driving" regarding check sheet D and the program example, respectively.

All OTs selected the choices "easy to use" and "useful" to the questions regarding the other items (without the tag). Additionally, there were comments such as "it was useful in explaining the driving license system to patients" and "it served as a guide for training."

4. Reasons for non-use of the manual by 71 OTs (Table 6)

The reasons for non-use of the manual by 71 OTs after the manual distribution included 1) "I don't treat the stroke survivors in my job" in 20

Table 6. Reason for non-use of the manual by 71 OTs

Reason	OTs	field of OT		
1) I don't treat the stroke survivors in my job	20	Physical field (1) Geriatric field (2)	Mental field (6) Education field (10)	Developmental field (1)
2) Although I treat the stroke survivors, support for resuming driving is not allowed at my place of work	7	Physical field (6) Mental field (1)		
3) Although I treat the stroke survivors, I was not in charge of such a case suitable for the resuming driving after the manual distribution	38	Physical field (20)	Mental field (1)	Geriatric field (17)
4) Although I treat the stroke survivors, I use other materials as a reference for resuming driving	3	Physical field (2)	Geriatric field (1)	
5) Others	3	Physical field (2)	Mental field (1)	

OTs, 2) "Although I treat the stroke survivors, support for resuming driving is not allowed at my place of work" in seven OTs, 3) "Although I treat the stroke survivors, I was not in charge of such a case suitable for the resuming driving after the manual distribution" in 38 OTs, 4) "Although I treat the stroke survivors, I use other materials as a reference" in four OTs, and 5) "others" in three OTs (I didn't aware of the manual; I consult with a physician; no response).

The OTs mentioned in 1), 2), 4), and 5) were excluded from the analysis of the usefulness of the manual because obviously they had no opportunity to use the manual. The analysis was performed on the remaining 38 OTs mentioned in 3), assuming that although they did not actually use the manual, they would use it if an opportunity arises. Of the 38 OTs, 19 OTs (a mean OT experience of them was 15.8 ± 10.3 years) reported to have supported the driving resumption before the manual distribution. They had supported 56 stroke survivors in resuming driving (support responded to consultation: 39 cases, support proposed by OT: 17 cases), and the median of the cases per year was 0.20 [interquartile range, 0.09–0.41].

5. Wishes of 71 OTs concerning the use of the manual (Table 7)

To the question "Do you wish to use the manual (even partially) if given an opportunity in the future?" 51 to 59 (78% ~91%) of 65 OTs except 6 OTs who did not answer this replied

"Yes" to each item; the number of OTs wishing to use the manual was significantly greater than those who had no wish to use it by exact binomial test ($p < 0.001$).

There were 250 positive comments including "I can check necessary information," "I can provide explanation more easily," and "this is what I wanted." By contrast, there were 45 negative comments including "there are too many contents and it takes a lot of time," "the criteria are not clear," and "test tools are not available." In this way, there were more positive comments than negative comments.

III. Discussion

1. About the manual contents

Seeing that the stroke survivors became more engaged in cultural and social activities by expanding their activity sphere after resuming driving, we speculate that the driving resumption can contribute to the improvement of the QOL of the stroke survivors and their families by preventing them from being housebound and promoting an active life^{1, 2)}. Concurrently, we must realize that driving is a risk factor for serious accidents even in healthy people. The stroke survivors may have a risk of having an epileptic seizure and/or recurrent stroke while driving. Therefore, risk avoidance of dangerous driving resumption is also an important part of the support program. In making the present manual, there

Table 7. Wish of 71 OTs concerning the use of the manual

11 items in the manual	Wish to use the manual		comments	
	OTs wish to use the manual	OTs not wish to use the manual	Positive	Negative
1) Check sheet A to collect information of the subjects	59	6 ***	23	3
2) Check sheet B to provide driving-related information	57	7 ***	20	4
3) Check sheet C to assess physical function	56	9 ***	24	7
4) Check sheet D to assess cognitive function	51	13 ***	17	11
5) Rehabilitation program for resuming driving (example)	57	8 ***	18	4
6) Driver's license system	59	6 ***	30	2
7) Driving aptitude consultation and aptitude test	58	7 ***	23	3
8) Mental and physical function required for driving	57	7 ***	26	2
9) Knowledge of car modification -Purchase & attachment of driving auxiliary equipment-	58	6 ***	24	2
10) Primary taxation systems and subsidy systems of the government and municipalities	59	6 ***	23	3
11) Facilities and services available at driving schools	57	8 ***	22	4
Mean (total)	57.1	7.5	22.7(250)	4.1(45)

The comparisons of wish/no wish to use the manual were performed using the exact binomial test.

*** : $p < 0.001$

The total number of respondents for items 2), 4), 8) and 9) is 64 as one OT did not answer.

was a tendency to focus on the support for resuming driving in a narrow sense, aiming to encourage active participation of OTs in driving rehabilitation. However, the issues regarding the prevention of dangerous driving and alternative strategies if driving is not allowed should be included more in future versions of the manual.

Needless to say, cognitive dysfunction is the biggest problem that hinders driving among the stroke survivors. Recent studies on the assessment of driving ability focusing on cognitive function have been conducted in Japan and Western countries²⁵⁻³⁰⁾. On the basis of these findings, we made the draft manual and examined its validity. After confirming that the check contents in 4 check sheets, program example, and driving-related information were valid in general, we completed the manual after minor revisions. Because there was no established assessment method for evaluating the cognitive function required for driving, we included a list of many psychological tests (more than 10) in check sheet D to assess cognitive function, which resulted in negative comments such as “there are too many contents and it takes a lot of time,” and “test tools are not

available.” Probably the respondents considered that all tests were mandatory. The number of test tools need to be reduced in the future, considering the burden on the users.

Many studies on the assessment of driving ability after stroke in Western countries have used the behind-the-wheel/on-road driving tests as gold standards³¹⁾. In Japan, some hospitals in collaboration with a driving school attempted to evaluate the driving ability by using actual cars^{25, 26)}. In line with this approach, we consider that effective assessment and instruction in driving rehabilitation are best achieved in real-world settings in collaboration with driving schools. However, we did not emphasize this issue in the present manual, because such collaboration was difficult in many areas of our country yet, especially in Aomori Prefecture. Considering the current trend of increased attention to driving rehabilitation after stroke, testing and instruction using actual cars should be included in the manual in future.

2. Support activities provided by using the manual

After addressed the content validity of

the manual in step I, the manual use was investigated in step II. Before November 2013, the number of the stroke survivors supported resuming driving by one OT per year was 0.4 in Aomori Prefecture. This means that one OT supported one stroke survivor at most per 3 years before the manual distribution. Taking into consideration that there were many other OTs who have not experienced in driving rehabilitation, support activities for driving resumption by OTs were surmised rare. When it's based on such situation, seven months as a study period of the manual use was considered to be short. However, the results showed that the cases per year supported by one OT increased from 0.38 (before the manual distribution) to 4.25 (after the manual distribution), which was an 11.2-fold increase, and the difference was statistically significant ($p < 0.05$). However, the study period before and after the manual distribution was not equal in length, and there might have been an influence of the difference in the number of the stroke survivors who were the candidates for support. We considered that the possibility of the incidence of stroke differing between the periods was low, because there were no significant changes in the incidence and severity of stroke during the study period in Aomori Prefecture³²⁾, and 38 OTs who did not use the manual reported that they had no stroke survivors requiring support after the manual distribution.

Although the present study did not examine the outcomes of the support provided by using the manual, comparatively younger OTs with mean OT experience of 6 years challenged to support more after the manual distribution than before, and that they reported that the manual was easy to use and useful. From these results, it was suggested that the manual might have been useful for some OTs in the point of promoting the first step in the support for

resuming driving of the stroke survivors.

3. The rationale for the promotion of support through the use of the manual

We consider that the primary reason for the improvement in support activities through the use of the manual is its comprehensive nature: Part I provides check sheets in which the procedures are listed, while Part II provides referential information. Using check sheet A to collect information of the subjects, an OT can start his/her action to collect information regarding the subject's driving habits before stroke and clarify the patient's wish to resume driving. The OT and the subject can think together about the disadvantages of not driving, as well as an alternative strategy if driving is not allowed. In addition, the OT can listen to the underlying emotional needs of patients and their families. We believe that even listening to the expectations of the subjects and their families and thinking together is the first step for successful support. Using check sheet B to provide driving-related information, an OT can confirm whether essential information has been provided and refer to the information written in Part II if needed. Because the information regarding community resources is included, the OT can save time and effort. Such a convenience may promote support activities. Using check sheet C to assess physical function, an OT can evaluate a patient's physical function including visual acuity and visual field, and using check sheet D to assess cognitive function, an OT can evaluate cognitive functions such as attention and visuospatial ability required for driving, while referring to the criteria written in the "mental and physical function required for driving" in Part II.

We consider that the combination of the check sheets and referential information is the advantage of the manual, and the rationale for the promotion of support through the use of the

manual. Although, currently there are several manuals or guidelines focusing on information provision^{7, 33, 34)} to our knowledge, this is the first attempt to make a manual consisted by check sheets and referential information.

4. Limitations in this study and future challenge

Only 77 of the 662 OTs responded to the questionnaire survey on the manual use. The low response rate might have been partly attributable to the OTs' diminished interest, considering that it was the second questionnaire they received from us. In addition, we suppose that some of the OTs might have thought that they had no obligation to respond to the questionnaire because they were not involved in stroke rehabilitation. We also suppose that the general interest in the field of driving rehabilitation was low even among OTs caring for people with physical impairment. It is unlikely that these non-respondents were actively involved in the support for driving resumption. We therefore consider that the results of the present study might have reflected the current status of the support activities for driving resumption undertaken by OTs in Aomori Prefecture, although further investigation on this issue is required.

This study has several limitations; it did not evaluate the outcomes of the support activities by using the manual and did not address other practical issues such as the time schedule, feedback of the results, and medical costs. We consider that the manual should be continuously improved by learning from users and other researchers. The results of the present study suggest limited usefulness of the manual in supporting driving resumption. Issues regarding the prevention of dangerous driving and alternative strategies if driving is not allowed are future research topics. The 2015 version of the manual is available on the home page of Hirosaki University of Health and Welfare³⁵⁾. We

plan to update the manual every year.

Conclusion

The results of this study suggested that the check sheets to guide actions of supporters and providing local car-related information are useful in the view of promoting efforts to support the stroke survivors in resuming driving.

Acknowledgments

The author is grateful to OTs in Aomori Prefecture who participated in this study by filling in the questionnaires regarding the draft manual and the manual.

References

- 1) Narita T, Noda M, Ishii Y, Harata T. Driving status of patients with stroke-induced hemiplegia. *Japanese Journal of Balance of Life*. 2011;7:1-7.(in Japanese)
- 2) Narita T, Noda M. Feelings of patients, their families, and occupational therapists toward resumption of car driving by patients after stroke, a focus on items related to driving school. *Jidoshagakko (Driving school)* 2012;10:29-32.(in Japanese)
- 3) Hashimoto K, Ohashi M, Onishi M, Watanabe S, Tamagaki T, Ono M. Car driving by patients with cerebrovascular disease. medical issues and criteria for permitting car driving. *JJAOT*. 2002;36:8-14.(in Japanese)
- 4) Takehara I. Driving status and problem of the patients with brain damage. *Sogo Rehabilitation*. 2010;38:457-461.(in Japanese)
- 5) Noda M, Harata T. Current status of assessment and guidance of car driving by people with disabilities in Aomori Prefecture. *Japanese Occupational Therapy Congress and Expo 2009 [CD-ROM]; F2-1-2, 2009*.(in Japanese)
- 6) Narita T, Noda M. Equipment and services for post-stroke patients in driving schools. The

- Japanese Occupational Therapy Congress Proceedings 2012 (CD-ROM); o1311.(in Japanese)
- 7) Sato N, Tozato F, Yamada Y, Takahashi E, Takeda S, Ookami N. Introduction of "Drive Ogino ver1.1": Efforts to assist resumption of car driving. *JJAOT*. 2011;45:175-179.(in Japanese)
 - 8) Manzai T, Tawada S, Ogawa T, Tsuchijima M, Suzuki H. Driving as an activity related to social life. *Sogo Rehabilitation*. 1992;20:907-910.(in Japanese)
 - 9) Sato A. Driving of patients with cerebrovascular disease: Current status and future prospect of approaches in occupational therapy. *JJAOT*. 2002;36:15-22.(in Japanese)
 - 10) Aomori Prefectural Police. Information on the driving tests for people with expired driver license. Available from: https://www.police.pref.aomori.jp/koutub/menkyo/shiken/30shik_ko_top.html [Accessed 31 October 2015].(in Japanese)
 - 11) Enforcement regulations for the road traffic law (Ministerial ordinance issued by Prime Minister's Office, Act No. 60 of 3 December 1960): Article 23. Available from: <http://law.egov.go.jp/htmldata/S35/S35F03101000060.html> [Accessed 1 December 2015].(in Japanese)
 - 12) License Division of the Traffic Bureau of the National Police Agency. A notice on the regulations regarding the driving license for people with a certain disease. Available from: https://www.npa.go.jp/pdc/notification/koutuu/menkyo/menkyo_20150803-1.pdf [Accessed 13 December 2015].(in Japanese)
 - 13) Tamaru F. Personalized motorized mobility for people with physical dysfunctions: Higher brain function deficit and driving. *JJAOT*. 2004;23:420-424.(in Japanese)
 - 14) Schanke AK, Sundet K. Comprehensive driving assessment: neuropsychological testing and on-road evaluation of brain injured patients. *Scand J Psychol* 2000;41:113-121.
 - 15) Nouri FM, Lincoln NB. Validation of a cognitive assessment : predicting driving performance after stroke. *Clin Rehabil* 1992;6:275-281.
 - 16) Ogura Y, Ikeda Y, Nakahira A, Muraki T, Yoneda N. Evaluations of assessment tools in predicting driving ability of people with higher brain dysfunction. *The Journal of the Ibaraki Prefectural University of Health Science Hospital* 2007;10:59-64.(in Japanese)
 - 17) Okazaki T, Ueda M, Saeki S, Hachisuga K. Assessment of driving ability in patients with unilateral spatial neglect. *Journal of Clinical Rehabilitation Suppl. Ver. 2*, ed. by Eto F, et al, Ishiyaku Shuppan, Tokyo, 2004, pp299-301.(in Japanese)
 - 18) Maeda M, Kubota T, Maeda M, Yoshiwara H, Benino T. Problems in driving by people with higher brain dysfunction. *Sogo Rehabilitation* 1994;22:127. (in Japanese)
 - 19) Okamoto I, Horiguchi M. Driving of post-stroke patients. *Sogo Rehabilitation*. 1987;15:447-451.(in Japanese)
 - 20) Perrier MJ, Korner-Bitensky N, Mayo NE : Patient factors associated with return to driving post stroke : findings from a multicenter cohort study. *Arch Phys Med Rehabil* 2010;91:868-873.
 - 21) The National Tax Administration Agency. No.6214 Cars for handicapped. Available from: <http://www.nta.go.jp/taxanswer/shohi/6214.htm> [Accessed 13 December 2015].(in Japanese)
 - 22) Aomori Prefectural Government. Information on prefectural tax and municipal tax: reduction of automobile tax and automobile acquisition tax. Available from: <http://www.pref.aomori.lg.jp/life/tax/> [Accessed 1 April 2015]. (in Japanese)
 - 23) Aomori Prefectural Police. Procedures to apply for a Disabled Parking Permit (for handicapped). Available from: https://www.police.pref.aomori.jp/koutubu/kisei/jyogai_hyousyou2.html [Accessed 13 December 2015]. (in Japanese)
 - 24) Hayashi K, Fuchi M, Asami I. Driving ability of CVA patients assessed by visual reaction time. *JJAOT*. 1990;9 (Suppl.): 112.(in Japanese)
 - 25) Kato T, Suetsuna T, Ninomiya M, Kishimoto S, Sato T, Inobe J. Driving assessment for patients with higher brain dysfunction: Introduction of CARD cooperation with car driving school. *Sogo Rehabilitation*. 2008;36:1003-1009. (in Japanese)

- 26) Sotokawa T, Oda T, Yamakura H, Kikuchi T, Sakimura Y. The examination of neuropsychological criteria in car driving resumption program. *Sogo Rehabilitation*. 2013;41:373-378. (in Japanese)
- 27) Yamazaki M, Nakamura Y. Evaluations of physical and cognitive dysfunction and driving support in patients with brain damage. *Sogo Rehabilitation* 2010;38:755-759. (in Japanese)
- 28) Mimura M: Car driving by patients with higher brain dysfunction. *Higher Brain Function Research*. 2011;31:157-163. (in Japanese)
- 29) Marshall SC, Molnar F, Malcolm MSH, Blair R, Brosseau L, Finestone HM, Lamothe C, et al. Predictors of driving ability following stroke: A systematic review. *Top Stroke Rehabil*. 2007;14:98-114.
- 30) Tanaka H, Ito E, Sato C, Ochiai Y, Fukui M. Behavioral characteristics and functional properties of patients with higher brain function in car driving. *Sogo Rehabilitation*. 2014;42:455-462. (in Japanese)
- 31) Galski T, Bruno RL, Ehle HT. Prediction of behind-the-wheel driving performance in patients with cerebral brain damage: A discriminant function analysis. *Am J Occup Ther*. 1993;47:391-396.
- 32) Estimated number of people with stroke and those requiring long-term care after stroke in prefecture. Available from: http://www.stroke-project.com/dl_data_pdf.htm [Accessed 14 December 2015]. (in Japanese)
- 33) Driving guidebook for people with disabilities by Tokyo Metropolitan Rehabilitation Hospital. Tokyo Metropolitan Government, 2010. (in Japanese)
- 34) Japanese Association of Occupational Therapists: Assisting patients with cognitive dysfunction in driving (Occupational therapy manual 53). Japanese Association of Occupational Therapists. Tokyo, 2012.
- 35) Hirosaki University of Health and Welfare. Available form: <http://university.hirosakiuhw.jp/kyoinsyokai/teacher/ot/naritat.html> [Accessed 14 December 2015]. (in Japanese)