

Challenges and Realities of Interdisciplinary Cooperation during Emergency Transport of Medically Complex Older Adults in Aomori Prefecture's Home Settings

Chizuru Yamazaki^{1,2)}, and Akemi Fujita²⁾

Abstract

“Aim” This study aimed to elucidate the current state and challenges of multi-professional cooperation in the context of emergency transportation for older adults with complex medical needs with the goal of facilitating seamless emergency transport for this demographic.

“Method” We targeted administrative staff, care workers, home-visit nurses, paramedics, and medical facility nurses involved in emergency transportation of older adults in a home setting in Aomori Prefecture. We conducted an anonymous self-administered questionnaire survey on cooperation, including the “face-to-face relationship evaluation scale for home medical workers” and “multi-professional cooperation behavior scale.”

“Result” Many respondents indicated cooperation between various jobs; however, face-to-face relationships were predominantly cultivated among administrative staff, care workers, and home-visit nurses involved in home medical care. Conversely, paramedics involved in emergency medical care exhibited limited face-to-face relationships with other professionals.

“Considerations” The absence of “face-to-face relationships” or “multi-professional cooperation” among paramedics might be attributed to their limited involvement, primarily during ambulance transport. To transport older adults in case of an emergency, it is necessary to establish communication methods using Advance Care Planning (ACP) and develop tools for collecting medical information in emergency situations. It is also essential to constantly circulate information by communicating, updating, and utilizing information tools, resulting in multidisciplinary cooperation.

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Key words: emergency care for older adults; multi-professional cooperation; -face-to-face relationships.

Introduction

Currently, the population of Japan is aging at an unprecedented speed¹⁾. Therefore, it is imperative to ensure that individuals with illnesses recuperate in their own homes and other familiar environments while maintaining their independence. The accomplishment of this goal necessitates cooperation of local medical and nursing care organizations to provide comprehensive care and continuous home-based medical and nursing services. The Ministry of Health, Labor and Welfare, in conjunction with

relevant institutions, is promoting the establishment of an integrated system for home medical care and nursing care through multi-professional cooperation²⁾.

As the older adults' population grows, the demand for emergency medical care rises proportionately, leading to an annual increase in ambulance transports. Regarding the number of people transported by ambulance in 2021, elderly individuals accounted for 61.9% of the total, and the highest percentage (23.4%) was observed in individuals aged ≥ 85 years. Moreover, circulatory system-related diseases, including

¹⁾ Hirosaki University of Health and Welfare, Faculty of Nursing

²⁾ Hirosaki University Graduate School of Health Sciences

Correspondence: C. Yamazaki

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✉ : Chizuru Yamazaki Hirosaki University of Health and Welfare, Faculty of Nursing
E-mail: ymazakic@jyoto-gakuen.ac.jp

brain and heart diseases, account for 16.4% of total cases, and the rate of these diseases is particularly high in older adults (20.3%). Analyzing the degree of injury and disease revealed that 55.7% of all patients experienced moderate or severe injuries; this rate was markedly higher in older adults (65.5%)³⁾. Thus, in addition to the number of older adult patients increasing annually, many seriously ill patients also require hospitalization. This group often comprises individuals living alone or requiring care due to advanced age⁴⁾; obtaining cooperation of family members, even if family members are living together, is challenging. This issue contributes to emergency medical exits. If older adults who usually receive medical care at clinics or home visits experience a sudden change in their needs, medical care available to them is limited. While regional medical cooperation systems can aid in identifying transport destinations, ambulance transport without proper coordination may result in considerable delays in locating suitable facilities after ambulance arrival⁵⁾. According to Aruga *et al.*⁶⁾, regional emergency medical care is required to establish seamless cooperation with various areas surrounding older adults. Abe *et al.*⁷⁾ elucidated the current situation and challenges related to cooperation in support of older adults and revealed a lack of comprehensive understanding among institutions about the roles and responsibilities of various professions. This suggests the importance of deepening our understanding of occupational roles through workshops and networking events. An investigation conducted by the author on cooperation between emergency outpatient nurses and paramedics in Aomori Prefecture found that while both parties recognized the importance and efficacy of cooperation, this awareness did not translate into effective cooperation⁸⁾.

In light of these dynamics, the demand for

enhanced emergency medical cooperation is evident. Surveys and initiatives are about cooperation among nursing care and nurses ongoing. However, despite these efforts, there are currently no studies regarding multi-professional cooperation during transportation. Aomori Prefecture has a high aging rate on a national scale¹⁾, and an increase in the number of older adults' patients transported by ambulance is anticipated. To ensure the safe and secure life of older adults with illnesses within their familiar homes, seamless ambulance transportation for such individuals should be established.

Aim of the research

This study aims to elucidate the prevailing circumstances and challenges concerning multi-professional cooperation during emergency transportation of older adults' individuals residing at home to optimize the transportation process for those with elevated medical requirements.

Operational definition of terms

1) Multi-professional cooperation

Leuts⁹⁾ defines cooperation as linking, coordinating, and establishing a network that functions like a single organization, referred to as "full integration." In this study, multi-professional cooperation is defined using Leuts' definition and encompasses administrative staff, care workers, nurses, and paramedics.

2) Older adults with high medical needs

Based on Otaga *et al.*'s study¹⁰⁾, this research identifies older adult individuals undergoing medical treatment among those necessitating home-based nursing care. Specifically, we aimed to identify individuals residing at home and requiring nursing care level 1 or higher, including suction, tube feeding, and urinary catheter management, as well as those who are at high risk of sudden deterioration.

Significance of the research

By clarifying the real-world situation and challenges associated with multi-professional cooperation during the emergency transport of medically vulnerable older adults at home, this study aims to increase the awareness of multi-professionals engaged in regional emergency medical care. By bolstering cooperation, this study anticipates the facilitation of a safe and secure home environment for the increasing population of older adult individuals with elevated medical needs in the future.

Research method

1. Participants

This study included medical facility nurses, home-visit nurses, older adult care workers (including those from short-term admission facilities, day service centers for older adults, and regional comprehensive support centers), paramedics, and administrative staff responsible for the care and welfare of older adults in Aomori Prefecture.

2. Data collection period

Data were collected between January 14 and March 31, 2021.

3. Data collection method

After explaining the aim and method of the research in writing to the administrator of the institution to which the participants belonged and obtaining consent, participants were provided with an explanatory document, an anonymous self-administered questionnaire, and a collection envelope. Upon completion, participants sealed and mailed the questionnaire themselves.

4. Research contents

The data collected included participants' basic

attributes, existence of multi-professional cooperation and related occupations, availability of tools for collecting information, understanding of living will, and results of the face-to-face relationship evaluation scale for home medical workers (Table 1) and the multi-professional cooperation behavior scale (Table 2).

"The Face-to-Face Cooperation Interprofessional Work relationship evaluation scale for home care workers," developed by Fukui¹¹⁾, measures the "goodness of building visible relationships with other occupations in the community from the viewpoint of medical and care workers related to home care users". It consists of 21 items, seven subscales, and three items for each subscale, with scores ranging from 21–105 points. The "Multi-Professional Cooperation Behavior Scale" was developed by Fujita et al.¹²⁾ and consists of five subscales and 17 items, with scores ranging from 17–85 points. The reliability and validity of these two scales have been previously verified.

5. Data analysis

Basic attributes and cooperation with other facilities and occupations were tabulated, and the χ^2 test was performed for each occupation and the availability of tools for collecting medical information and understanding of living will.

To investigate the relationship and cooperation between the five occupations, we quantified and compared the scores of the "face-visible relationship evaluation scale among home care workers" and the "multi-occupational cooperation behavior scale." In this study, the parameters differed greatly, and normality was denied by the Shapiro-Wilk test. Therefore, for the comparison of three or more independent groups with a nonparametric test, we compared the cooperation of individual occupations after the test by Kruskal-Wallis. Multiple comparisons by Bonferroni were performed for this purpose. Statistical significance was set at $< 5\%$ and all statistical analyses were performed using IBM

Table 1. The “Face to Face Cooperation” Interprofessional Work Scale

Questions	I don't think so	I don't really think so	I can't say either	I think so a little	I think so
1) I can easily ask people at other facilities who are looking at patients (users) anything you want to know.					
2) I am able to contact patients without hesitation about the patients (users) they are seeing together.					
3) I know the best time and method to contact other professionals regarding the patients (users) you see together.					
4) I understand the problems that other professions in the area are having with patients (users).					
5) I understand the working styles of other professions that are involved with patients (users).					
6) I understand what other occupations that involve patients (users) can do					
7) I understand the names, faces, ways of thinking, and policies of the various professions involved with patients (users)					
8) I understand the philosophy and circumstances of facilities involved with patients (users)					
9) I understand the personalities and ways of interacting with the various professions involved with patients (users)					
10) There are opportunities for various professions involved with patients (users) to meet and talk face-to-face.					
11) I have the opportunity to talk with people from different professions that I don't normally interact with and gain new perspectives and new acquaintances.					
12) there are opportunities to share and discuss issues and concerns regarding regional cooperation					
13) There are people who are involved with patients (users) and can be easily consulted.					
14) I generally know who to ask if I have a problem with patients (users).					
15) If I have a problem with a patient (user), there is someone to talk to over the phone.					
16) I understand local nursing care services available to patients (users)					
17) I understand local medical resources and medical services available to patients (users)					
18) I am able to specifically explain available local medical resources and services to patients (users) and their families.					
19) At the time of discharge or hospitalization, I think about what kind of information the other person needs when making a request or providing information.					
20) For patients (users) who are transitioning to home (facility), conferences and information are provided at the time of discharge.					
21) Regarding patients (users) being discharged from the hospital, we have decided what to do and who to contact in case their condition suddenly changes.					

SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA).

6. Ethical consideration

After obtaining informal consent from the facility heads, participants received written information clarifying the research's purpose, highlighting voluntary participation, protection of privacy, and ensuring anonymity. The information stated that data would be used for research purposes only. Consent for research cooperation was inferred upon returning the questionnaire. This study was approved by the Ethics

Committee of Hirosaki University Graduate School of Health Sciences (reference number:2020-001, approval date: November 25, 2021).

Results

The questionnaire was distributed to 1,249 people, and 556 responses were obtained, of which 530 were deemed valid (response rate: 42.4%).

1) Participant characteristics

The respondents comprised 10 administrative

Table 2. Multi professional cooperation action scale

Questions	Not at all applicable	Not very applicable	Neither agree nor disagree	Applicable	Very applicable
1) I gathered information from other occupations about the wishes of users and their families regarding how they will spend their time in the future.					
2) I communicated the wishes of users and their families regarding how to spend their time in the future to other professions.					
3) I gathered information from other professions about how patients and their families understand the illness and condition.					
4) I communicated with other professions how patients and their families understand the disease and condition.					
5) I predicted changes in the user's living situation that may occur in the future (e.g., a decline in food intake and excretion independence) based on my expertise and communicated them to other professions.					
6) I predicted future changes in the user's medical condition (e.g. the appearance of symptoms as the disease progresses) based on my expertise and communicated this to other professions.					
7) I anticipated future changes in the family situation (e.g. family feelings, increased nursing care burden, etc.) based on my expertise and communicated this to other professions.					
8) The entire team reached an agreement on the care policy and care plan.					
9) I exchanged opinions with other professions regarding care policy and care plan.					
10) I proposed changes to the care plan (including the content and frequency of services provided by other professions) to other professions in a team based on changes in the patient's condition.					
11) I gathered information on the specific content of services provided by various professions.					
12) I built relationships with people from other professions who formed a team so that I could ask them anything without hesitation.					
13) I communicated the specific details of the services I provide to other professions.					
14) Have regular opportunities to meet with people from other professions (study sessions, conferences, etc.)					
15) Conveyed words of appreciation and positive evaluation to other professions.					
16) In the event of an emergency, there was a system in place where other professions who formed a team could contact each other immediately.					
17) During normal times, there was a system in place to share information between teams in other professions (communication networks, information exchange tools, etc.)					

staff members responsible for the welfare section, 186 care workers, 45 home-visit nurses, 247 paramedics, and 68 medical facility nurses.

The medical facility nurses reported an average occupation experience of 23.4 ± 9.2 , which was longer than that of other occupations.

Furthermore, paramedics reported an average

occupation experience of 14.4 ± 8.1 years longer than that of other occupations (Table 3).

2) Inter-occupation cooperation

Regarding cooperation with other facilities and professions, the respondents indicated participation as follows: administrative staff (n =

Table 3. Respondent basic attributes

		n=556				
		Administrative staff	Care workers	Home-visit nurses	Paramedics	Medical facility nurses
n(%)		10 (1.8)	186 (33.5)	45 (8.1)	247 (44)	68 (12.2)
Years of job experience	Mean ± SD	14.3 ± 10.8	14.7 ± 8.7	15.5 ± 11.0	11.9 ± 5.9	23.4 ± 9.2
Years of experience in department	Mean ± SD	5.0 ± 3.1	7.9 ± 6.4	5.9 ± 5.3	14.4 ± 8.1	7.2 ± 6.7

Table 4. Existence of collaboration with each occupation

		n=556					
		Administrative staff	Care workers	Home-visit nurses n (% in the area)	Paramedics	Medical facility nurses	p -value
Presence	10 (100)	173 (93.0)	44 (97.8)	190 (76.9)	57 (83.8)	**	
Absence	0 (0)	13 (7.0)	1 (2.2)	57 (23.1)	11 (16.2)		

χ^2 test **p <0.001

10 (100%), home-visit nurses (n = 44 (97.8%), care workers (n = 173 (93.0%), medical facility nurses (n = 57 (83.8%), and paramedics (n = 190 (76.9%) (Table 4).

Administrative staff collaborated with regional comprehensive support centers (n=9, 90.0%), medical facility doctors (n=7, 70.0%), social workers (n=7, 70.0%). Home-visit nurses collaborated with medical facility doctor (n=43, 95.6%), medical facility nurses (n=33, 73.3%), care workers (n=31, 68.9%) and community comprehensive support centers (n=31, 68.9%). Paramedics collaborated with medical facility doctors (n=166, 67.2%) and medical facility nurses (n=157, 63.6%). Medical facility nurses collaborated with medical facility nurses (n=40, 63.6%), medical facility doctor (n=37, 54.4%) and social workers (n=35, 51.5%) (Table 5).

3) Tools for collecting information on older adults at home in emergencies in each occupation.

Regarding the availability of tools for gathering information about older adults at home during emergencies, a significant number of occupations stated that they did not have tools for gathering information about older adults

(Table 6).

4) Level of understanding regarding living will

Overall, 10.0% of the administrative staff responded that they understood the will to live "very well," while 50% responded that they "understood" the concept; thus, 60.0% of the administrative staff had some degree of understanding on the will to live. Among care workers, 9.2% responded that they understood the will to live "very well" and 45.4% responded that they "understood" the concept; therefore, 54.6% of care workers showed some degree of understanding. Further, 28.9% of home-visit nurses responded that they understood the concept "very well," while 57.8% said they "understood" it, thereby leading to a total of 86.7% of home-visit nurses with some degree of understanding. Las Among paramedics, 19.4% responded that they understood the will to live "very well" and 72.1% responded that they "understood" the concept; thus, 91.5% of paramedics had some degree of understanding. Lastly, among medical facility nurses, 9.0% responded that they understood the will to live "very well" and 64.2% responded that they

Table 5. Collaboration with other facilities and multiple occupations

	Administrative staffs	Care workers	Home visit nurses n (% in the area)	Multiple answers	
				Paramedics	Medical facility nurses
Medical facility doctor	7 (70)	92 (49.5)	43 (95.6)	166 (67.2)	37 (54.4)
Care facility doctor	0 (0)	16 (8.6)	7 (15.6)	39 (15.8)	5 (7.4)
Medical facility nurse	5 (50.0)	91 (48.9)	33 (73.3)	157 (63.6)	40 (58.8)
Visiting nurse	6 (60)	117 (62.9)	22 (48.9)	64 (25.9)	29 (42.6)
Care worker	6 (60)	104 (55.9)	31 (68.9)	47 (19.0)	15 (22.1)
Caregiver	3 (30)	68 (36.6)	24 (53.3)	45 (18.2)	16 (23.5)
Social worker	7 (70)	90 (48.4)	24 (53.3)	10 (4.0)	35 (51.5)
Administrative staff	6 (60)	77 (41.4)	14 (31.1)	34 (13.8)	8 (11.8)
Paramedic	2 (20)	14 (7.5)	6 (13.3)	60 (24.3)	28 (17.8)
Comprehensive Community Support Center	9 (90)	113 (60.8)	31 (68.9)	44 (17.8)	23 (33.8)

Table 6. Availability of tools for collecting information on the old adults at home in emergencies in each occupation

	Administrative staff	Care workers	Home-visit nurses n (% in the area)	Paramedics	Medical facility nurses	<i>p-value</i>
Presence	4 (44.4)	48 (26.2)	11 (24.2)	103 (41.7)	8 (11.8)	**
Absence	5 (55.6)	135 (73.8)	34 (75.6)	144 (58.3)	60 (88.2)	
χ^2 test						** <i>p</i> < 0.001

Table 7. Level of understanding regarding Living Will

	very understand	understand	don't really understand	not understand	<i>p-value</i>	
						<i>n = 553</i>
n (% in the area)						
Administrative staff	1 (10)	5 (50)	2 (20)	1 (10)		
Care workers	17 (9.2)	84 (45.4)	63 (34.1)	21 (11.4)		
Home-visit nurses	13 (28.9)	26 (57.8)	4 (8.9)	2 (4.4)	**	
Paramedics	48 (19.4)	178 (72.1)	20 (8.1)	1 (0.4)		
Medical facility nurs	6 (9.0)	43 (64.2)	17 (25.4)	1 (1.5)		
χ^2 test						** <i>p</i> < 0.01

"understood" the concept, thereby making a total of 73.2% of facility nurses with some degree of understanding. Our findings showed that the level of understanding among care workers was the lowest (Table 7).

5) “The Face-to-Face Cooperation” Interprofessional Work relationship evaluation scale in each occupation (Table 8)

The median scores on the "Face-to-Face Cooperation Interprofessional Work Relationship Evaluation Scale" varied among occupations: 85.0

for administrative staff, 81.5 for care workers, 87.0 for home-visit nurses, 54.0 for paramedics, and 65.0 for medical facility nurses. Paramedics yielded the lowest scores. There were significant differences among “paramedics/medical facility nurses” and “administrative staff/ care workers/ home-visit nurses.” Moreover, significant differences were also found between paramedics and medical facility nurses.

In the sub-item “Able to communicate easily with people involved in other facilities,” home-visit nurses and administrative staff had the

Table 8. The “Face-to-Face Cooperation” Interprofessional Work relationship evaluation scale

		Total score		Communicate with staff from other facilities.		Understand the roles of other occupations in the region		Know the names, faces, and thoughts of people involved in the community		
		<i>n</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>
Administrative staff	10	85.0	(76.0~91.0)		14.0	(12.0~14.0)	11.0	(10.0~12.0)	11.0	(9.0~12.0)
Care workers	186	81.5	(72.0~89.0)		13.0	(11.0~14.0)	11.0	(9.0~12.0)	10.0	(9.0~12.0)
Home-visit nurses	45	87.0	(75.0~92.0)	**	14.0	(12.0~15.0)	12.0	(10.0~12.0)	11.0	(9.0~12.0)
Paramedics	247	54.0	(42.0~63.0)	**	9.0	(8.0~12.0)	8.0	(6.0~10.0)	7.0	(5.0~9.0)
Medical facility nurses	68	65.0	(52.5~80.0)	**	11.0	(9.0~12.0)	8.0	(6.0~11.0)	6.0	(3.5~9.5)
		Opportunities to meet and discuss with local multi-professionals		There is a local network for consultation		Local resources can be understood concretely		Good cooperation between the hospital and the community		
		<i>n</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>
Administrative staff	10	12.0	(11.0~13.0)		12.0	(10.0~14.0)	14.0	(12.0~15.0)	11.0	(9.0~12.0)
Care workers	186	11.0	(8.0~12.0)		12.0	(11.0~14.0)	12.0	(11.0~14.0)	13.0	(12.0~14.0)
Home-visit nurses	45	11.0	(9.0~12.0)	**	13.0	(12.0~15.0)	12.0	(12.0~14.0)	14.0	(12.0~15.0)
Paramedics	247	6.0	(4.0~9.0)	**	8.0	(5.0~9.0)	7.0	(5.0~9.0)	7.0	(5.0~9.0)
Medical facility nurses	68	8.0	(5.0~11.0)	**	12.0	(9.0~13.0)	9.0	(7.0~12.0)	9.0	(7.0~12.0)

Multiple comparisons were performed using the Bonferroni test for those with significant differences in the Kruskal-Wallis test. *Mdn*:Median, * $p < 0.05$, ** $p < 0.01$

highest score (14.0), and paramedics had the lowest score (9.0). Significant differences were found among “paramedics/medical facility nurses” and “care workers/home-visit nurses.” Regarding “knowing the roles of other occupations in the community,” home-visit nurses had the highest score (12.0), and paramedics and medical facility nurses had the lowest score (8.0). Similar differences were observed among “paramedics/medical facility nurses” and “care workers/home-visit nurses.” In “knowing the names, faces, and ways of thinking of people involved in the community,” home-visit nurses and administrative staff had the highest score (11.0), and medical facility nurses had the lowest

score (6.0). Moreover, significant differences were observed among “paramedics/medical facility nurses” and “administrative staff/home-visit nurses/care workers.” In “opportunities to meet and talk with multi-professionals in the community,” administrative staff had the highest score (12.0), and paramedics had the lowest score (6.0). There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical facility nurses.” In “has a local network for consultation,” home-visit nurses had the highest score (13.0), and paramedics had the lowest score (8.0). There were significant differences between paramedics and “administrative staff/care

Table 9. Multi-professional cooperation behavior scale

<i>n</i> =556							
	<i>n</i>	Total score		Decision support		Share predictive judgment	
		<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>
Administrative staff	10	67.0 (54.0~70.0)		16.0 (15.0~16.0)		12.0 (9.0~15.0)	
Care workers	186	64.5 (58.0~69.0)	**	16.0 (14.0~16.0)	**	12.0 (10.0~12.0)	**
Home-visit nurses	45	68.0 (58.0~76.0)	**	16.0 (14.0~19.0)	**	12.0 (11.0~15.0)	**
Paramedics	247	39.0 (27.0~51.0)	**	11.0 (7.0~12.0)	*	6.5 (3.0~9.0)	**
Medical facility nurses	68	54.0 (42.0~64.0)	**	13.5 (11.0~16.0)	**	11.0 (9.0~12.0)	**
Coordination of plans of care							
	<i>n</i>	Coordination of plans of care		Team relationship		24-hour support system	
		<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>	<i>Mdn</i>	<i>p-value</i>
Administrative staff	10	9.0 (9.0~11.0)		18.0 (17.0~20.0)		7.0 (6.0~8.0)	
Care workers	186	12.0 (11.0~13.0)	*	18.5 (16.0~20.0)	*	8.0 (6.0~8.0)	*
Home-visit nurses	45	12.0 (10.0~14.0)	**	19.0 (17.0~22.0)	**	8.0 (7.0~9.0)	**
Paramedics	247	6.0 (3.0~9.0)	*	12.0 (8.0~15.0)	**	5.5 (2.0~6.0)	*
Medical facility nurses	68	9.0 (7.0~12.0)	**	16.0 (12.0~19.0)	**	6.0 (4.0~8.0)	**

Multiple comparis were performed using the Bonferroni test for those with significant differences in the Kruskal-Wallis test. *Mdn:Median*, **p*<0.05, ***p*<0.01

workers/home-visit nurses/medical facility nurses.” Moreover, significant differences were also found between medical facility nurses and home-visit nurses. In “knowing specific local resources,” administrative staff had the highest score (14.0), and paramedics had the lowest score (7.0). There were significant differences between paramedics and “administrative staff/ care workers/home-visit nurses/medical facility nurses.” Significant differences were also observed between medical facility nurses and “administrative staff/care workers/home-visit nurses.” In terms of “good cooperation between hospitals and communities, such as in pre-discharge conferences,” home-visit nurses had the highest score (14.0), and paramedics had the lowest score (7.0). Significant differences were

observed between paramedics and “care workers/home-visit nurses/medical facility nurses.” There were also significant differences between medical facility nurses and “care workers/home-visit nurses.”

6) Multi-professional cooperation behavior scale for each occupation (Table 9)

The median values for all items on the scale were 67.0, 64.5, 68.0, 39.0, and 54.0 for administrative staff, care workers, home-visit nurses, paramedics, and medical facility nurses, respectively. Home-visit nurses had the highest rate, and paramedics had the lowest. There were significant differences between paramedics and “administrative staff/ care workers/home-visit nurses/medical facility nurses.” There were also

significant differences between medical facility nurses and “care workers/home-visit nurses.”

In the sub-item “decision-making support,” administrative staff, care workers, and home-visit nurses scored the highest (16.0), and paramedics scored the lowest (11.0).

There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical facility nurses.” There were also significant differences between medical facility nurses and “care workers/home-visit nurses.” In “Sharing of predictive judgment,” administrative staff, care workers, and home-visit nurses had the highest score (12.0), and paramedics had the lowest score (6.5). There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical facility nurses.” There were also significant differences between medical facility nurses and home-visit nurses. In “adjustment of care policy,” care workers and home-visit nurses had the highest score (12.0), and paramedics had the lowest score (6.0).

There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical facility nurses.” There were also significant differences between medical facility nurses and “care workers/home-visit nurses.” In “team relationship building,” home-visit nurses scored the highest (19.0), and paramedics scored the lowest (12.0). There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical facility nurses.” There were also significant differences between medical facility nurses and “care workers/home-visit nurses.” In “24-hour support system,” care workers and home-visit nurses had the highest score (8.0), and paramedics had the lowest score (6.5). There were significant differences between paramedics and “administrative staff/care workers/home-visit nurses/medical

facility nurses.” There were also significant differences between medical facility nurses and “care workers/home-visit nurses.”

Discussion

1. Actual situation and issues of multi-professional co in ambulance transportation for older adults with high medical needs

The face-to-face relationship rating scale indicated that paramedics scored significantly lower on both the total score and subscales compared to other occupations.

The next lowest occupation was medical facility nurse. Other administrative staff, care workers, and home-visit nurses scored relatively high, suggesting that they had established face-to-face relationships. However, results indicated that paramedics and medical facility nurses did not have face-to-face relationships with administrative staff, care workers, or home-visit nurses.

Paramedics primarily focus on patient transportation and first-aid under medical guidance, often in prehospital scenarios when transporting injured patients to medical facilities¹³⁾. Thus, for paramedics, cooperation with other occupations may primarily occur within the context of prehospital activities when transporting injured patients to medical facilities. There may not be a relationship with a job, a care worker, or a home-visit nurse. The medical facility nurses in this study dealt with older adults' patients transported by ambulances. Medical facility nurses, such as paramedics, may not naturally connect with administrative staff, care workers, and home-visit nurses due to their tasks spanning prehospital activities to hospitalization. In contrast, administrative staff, care workers, and home-visit nurses extensively interact and are involved in the daily lives of older adults' patients, potentially leading to stronger relationships.

Regarding the “multi-professional cooperation behavior scale” used as an index of their own multi-professional cooperation behavior, Fujita et al.¹²⁾ stated that “factor 1: decision-making support” does not occur only at one point in time, but continuously based on changes in users. “Factor 2: sharing of predictive judgments” involves sharing judgments across professionals regarding future changes that may occur. Medical professionals are expected to determine and predict changes in medical conditions, while care workers report changes in users and families in a timely manner. “Factor 3: coordination of care policies” and “Factor 4: building team relationships” constitute basic elements of cooperation, and “Factor 5: 24-hour support system” encompasses 24-hour support during normal times and emergencies.

Paramedics scored significantly lower on both total and subscale scores of the multiprotection cooperation behavior scale. Paramedics are typically involved with older adults at the time of emergency transportation, and pre-transport information, such as decision-making support and predictive judgment, is not shared before sudden changes. It is believed that the score for the 24-hour support system was low because it was only for emergency transportation. The same is true for medical facility nurses who scored the next lowest on the multidisciplinary cooperation behavior scale, as this research focused on nurses who work in emergency-related departments; there is a high possibility that they are involved only during transportation. “Factor 1: decision support,” “Factor 2: shared predictive judgment,” and “Factor 5: 24-hour support system” had low scores. This indicates that low cooperation behavior scores are influenced by limited participation only during emergency situations.

Fukui's approach of quantifying the degree of face-to-face relationships provides a numerical means to assess connections and cooperation between various professions in a region and

develop a face-to-face relationship evaluation scale¹¹⁾. This study revealed that while face-to-face relationships existed among administrative staff, care workers, and home-visit nurses involved in home medical care, such relationships were lacking with paramedics involved in emergency medical care. This disparity indicates a lack of coordination between home and emergency medical care, highlighting an existing issue.

2. How multi-professional cooperation should be in the emergency transportation of older adults with high medical needs.

A study by Smith et al.¹⁴⁾ reported that 77% of older adult individuals who visited the emergency department in the month of their death remained in the hospital; among them, 68% died in the hospital. Interestingly, this trend significantly changed for older adult individuals who had utilized home care and nursing services for at least 1 month before their death, as they rarely visited the emergency department during their final month. This finding suggests a strong connection and mutual understanding between emergency nursing and home-visit nursing. By facilitating the exchange of information, we can ensure high-quality care for older adult individuals who wish to maintain their desired lifestyle until the end of their lives. In a previous study by the authors, many paramedics identified their goal of emergency medical care as lifesaving and as achieving “lifesaving without sequelae,” indicating a shift in paramedic priorities post-transportation¹⁵⁾. Yamagishi et al.¹⁶⁾ proposed a comprehensive approach to addressing emergency care concerns in older adults, involving acute care hospitals, primary care providers, specialists in nursing care institutions, the government, and citizens from their respective standpoints to cooperate with the entire community in the future. To promote interprofessional cooperation, Sodeyama et al.¹⁷⁾ emphasized the significance of establishing

designated places and times for direct interprofessional engagement and information sharing to promote effective cooperation. This emphasizes the necessity of regular face-to-face meetings and sustained relationships.

The Ministry of Health, Labor and Welfare's "home medical care cooperation base project"¹⁸⁾ emphasizes the importance of establishing "face-to-face relationships" between medical and welfare workers for effective cooperation in the community. The question "Do you understand living wills?" in the survey assessed the degree of understanding of ACP. The majority of paramedics answered that they understood (91.5%) the concept, whereas only 54.6% of care workers understood living wills. Therefore, caregivers, who are closest to older adults, do not fully understand the intentions of older adults during a sudden change through ACP solely. Information tools during emergencies for older adults living at home include knowledge about the family doctor, medical history, past medical history, oral medications, and key contact persons. This information can be obtained through sheets distributed by local governments that contain this medical information and are useful in cases where emergency personnel arrive and the patients are unable to respond due to unconsciousness. However, when asked in the survey, "Are there tools available to collect information in case of an emergency for older adults living at home?", many respondents answered "no" for jobs that involve working with older adults living at home.

To quickly transport older adults from home in the event of a sudden change, it is necessary to create a communication method using ACP and a tool for collecting medical information in an emergency. Information needs to be circulated constantly, using tools to communicate, update, and utilize information. For this purpose, it is essential to use tools to convey information about older adults from the government to care

workers and home-visit nurses who are directly involved in home care. Care staff and home-visit nurses need to add information to the tool and update it according to the patient's current situation. When the health of older adults suddenly deteriorates at home, the information tool will allow paramedics and medical facility nurses to quickly obtain information about them, leading to multidisciplinary cooperation. Furthermore, this will resolve the problem of the lack of face-to-face relationships between occupations involved in home medical care and those involved in emergency medical care. Thus, in addition to its use in medical care, linking the My Number card to nursing care could make it an important tool in emergencies.

To aid in promoting multi-professional cooperation, Leuts describes three stages of cooperation⁹⁾. The first stage involves connecting individuals with needs to the necessary services. The second stage centers around coordination, encompassing systematic information exchange and care management. The third stage surpasses the confines of individual facilities, leading to the creation of a unified organization that operates holistically. To achieve full integration, administrative staff members, who gather information related to home medical care, are poised to play a central role in establishing an interconnected network that bridges multiple occupations. They will play a central role in building a network with emergency medical care, "full integration" connecting various professions, "linkage" sharing information with common recognition, and establishing designated forums to understand each other's roles, fostering "coordination" to facilitate smooth cooperation between home medical care and emergency medical care.

Limitations of this research and future issues

This study's participant pool, while suitable for analysis, is not expansive, and its questionnaire-

based nature introduces the potential for diverse and biased individual perceptions of the options presented in the questionnaire. This research was conducted in 2021 before the awareness of coordination challenges between home and emergency medical care increased; therefore, there may have been differences in the respondents' perceptions of the scale. Furthermore, although Aomori Prefecture has a higher proportion of older adults than other prefectures, the extent of progress in implementing a community-based integrated care system remains uncertain, thus restricting the generalizability of this research.

Conclusion

This study aimed to elucidate the real-world conditions and challenges of multi-professional cooperation during emergency transportation for older adults' individuals with elevated medical needs to facilitate smooth emergency transportation for this population.

1. In Aomori Prefecture, government officials, care workers, home-visit nurses, paramedics, and medical facility nurses collaborated with multiple occupations. The administrative staff, care workers, and home-visit nurses shared a common partner, but the cooperation between paramedics and medical facility nurses was limited to emergency transport of older adults.
2. The occupation with significantly low scores on both the total and subscales of the multi-professional cooperation behavior scale was paramedics. This was because they were only involved in emergency transport.
3. Administrative staff, care workers, and home-visit nurses who are involved in home medical care have built face-to-face relationships with other workers; however, paramedics who are involved in emergency medical care have not built face-to-face relationships with other workers. To fill this gap, we have developed

an emergency communication method using ACP and a tool for sharing medical information of older adults living at home. Circulating information will lead to the creation of cooperation with other professions.

4. Administrative staff should play a central role in interprofessional cooperation regarding older adults with advanced medical needs. Their proactive engagement could foster the creation of a network encompassing emergency medical care ("full integration"), interlinking diverse professions ("linkage"), and establishing platforms for information exchange and mutual role comprehension ("coordination"). This will lead to seamless cooperation between home and emergency medical care.

In conclusion, this study's insights into multi-professional cooperation and its impact on emergency transportation for older adults with heightened medical needs provide valuable directions for enhancing coordinated care and ensuring the well-being of this vulnerable demographic.

Conflicts of interest

The authors have no conflicts of interest to declare.

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