Received: 27 January 2025 | Accepted: 12 May 2025

DOI: 10.1002/ams2.70067

ORIGINAL ARTICLE

ACUTE MEDICINE & SURGERY WILEY

Current state and challenges of multidisciplinary collaboration by fire defense headquarters in Japan: A nationwide cross-sectional survey

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Funding information
Japan Society for the Promotion of Science, Grant/Award Number: 22K21081, 23H03228 and 23K16326; Kyukyushinkou Zaidan

Abstract

Aim: The role of emergency medical service personnel has recently shifted, necessitating fire defense headquarters to engage in multidisciplinary collaboration with community organizations. However, evidence of this collaboration is limited. This study aimed to investigate the current state and challenges of multidisciplinary collaboration between fire defense headquarters and long-term care, welfare, and health organizations in the community.

Methods: A web-based cross-sectional survey was conducted in 2023 among fire defense headquarters in Japan to examine their collaboration with long-term care, welfare, and health organizations, as well as the challenges encountered during collaboration. Descriptive statistics were used for numerical data, and a qualitative descriptive method was applied to text data.

Results: A total of 529 participants, constituting a response rate of 72.9%, were enrolled in this study. A total of 445 (84.1%) fire defense headquarters collaborated with long-term care, welfare, and health organizations. The most common collaborating organizations were public health centers (62.5%), community comprehensive support centers (54.6%), and municipal departments of long-term care (40.0%). Challenges of collaboration included "cannot contact organizations during nights and holidays" and "cannot obtain patient information from organizations due to privacy reasons."

Conclusion: Fire defense headquarters and community organizations should continue fostering collaboration, addressing challenges, and adopting best practices, which will help define the role of fire defense headquarters within local collaborative frameworks.

KEYWORDS
community health services, cross-sectional survey, emergency medical service, intersectional collaboration, paramedic

INTRODUCTION

Paramedicine has undergone substantial evolution globally. Emergency medicine service (EMS) personnel are traditionally responsible for delivering medical care to patients before and during transportation to the emergency department (ED). Recently, EMS personnel are increasingly involved in acute and non-acute care settings. Up to 60% of patients who use an ambulance do not require immediate medical care,[1,2] owing to patients' social factors, such as economic deprivation, type of medical insurance, and loneliness.[3–6] EMS personnel can identify, understand, and address social factors influencing patients' health and daily life, because they often interact with patients with health and social service needs.[7]

Thus, their expanding role in non-acute situations compels them to make complex decisions regarding patient care and transport.

"Social determinants of health (SDHs)" are social factors that influence patients' health and are anchored on the understanding that people's health is influenced by social and environmental factors, including income, education, relationships, and living conditions.[8] SDHs affect health behaviors; contribute to onset of chronic diseases, such as cardiovascular disease and cancer; and hinder access to healthcare services. Because SDHs are challenging to tackle through individual efforts alone and contribute to health disparities, fostering collaboration among diverse organizations and professionals is recommended.[8,9] Multidisciplinary collaboration involves cooperation among professionals from multiple disciplines,[10] with the goal of providing holistic and patient-centered care that meets the diverse needs of patients, especially those with complex health and social conditions.[11] Multidisciplinary collaborative approaches are especially beneficial for older adults, who frequently encounter complicated health and social problems that require more interventions in addition to medical treatment.[12]

Since 2006, Japan has implemented a community-based integrated care system to foster cooperation among health, medical, long-term care, and welfare services to enable older people to continue living in familiar communities.[13] The core concepts of this system are community-based care—specific to and anchored on the community—and integrated care—referring to the combined provision of medical and long-term care services. In 2016, the concept of a community-based inclusive society was proposed to expand the community-based integrated care system for older people, extending support to financially disadvantaged individuals, children and families, and persons with disabilities, addressing fragmented systems and fostering an all-generation community.[14]

Given the increasing role of EMS personnel in acute and non-acute patient care settings, fire defense headquarters should actively engage in the development of integrated care systems by collaborating with community organizations. A recent Japanese study reported the development of a checklist designed to identify social and living conditions of older patients when brought to the ED, with the aim of sharing this information with multidisciplinary professionals.[15] However, the potential function of fire defense headquarters in the collaborative relationship with community organizations has not been elucidated. Furthermore, apart from one study that reported collaborative efforts for frequent ambulance users by the fire defense headquarters and municipal welfare department in Toyota City,[16] evidence regarding multidisciplinary collaboration between fire defense headquarters and long-term care, welfare, and health organizations in Japanese communities remains scarce. Therefore, this study aimed to investigate the current state and challenges of multidisciplinary collaboration between the fire defense headquarters and long-term care, welfare, and health organizations in the community.

MATERIALS AND METHODS

Study design and participants

We conducted a cross-sectional survey of all 726 fire defense headquarters in Japan from July to September 2023.

Survey procedure

An invitation letter containing the questionnaire survey link and QR code was mailed by a web-survey company (Cross Marketing Inc.) to 726 fire defense headquarters in Japan.[17] We asked participants to complete the survey online and sent reminder letters or emails 4 and 7 weeks after sending the questionnaire to improve the response rate.

Questionnaire

We drafted the original questionnaire by referring to research articles and textbooks on multidisciplinary collaboration.[10,16,18,19] Collaboration in the medical, health, and welfare fields is defined as "a process of interrelationship in which multiple individuals and institutions, including non-professionals, with shared objectives work together to achieve those objectives by proactively establishing cooperative relationships to address issues that cannot be resolved independently."[20] We adopted this definition in the present study. Moreover, herein, collaboration did not necessarily entail formal agreements between fire defense headquarters and other organizations; rather, it referred to consultations and the mutual exchange of patient information with relevant organizations. To ensure questionnaire content validity, we sought feedback on item clarity and relevance from four staff members working at the fire defense headquarters. We refined the wording of the items, revised the list of items by incorporating their feedback, and developed the questionnaire (Appendix S1).

We asked participants about their demographic information and collaboration with community organizations (Table 1). We categorized participants into three groups according to whether the fire defense headquarters collaborated with community organizations to provide emergency medical services: those who had collaborated or were collaborating (Group A: collaboration group); those who did not collaborate and were considering collaboration (Group B: no-collaboration/underconsideration group); and those who did not collaborate and did not consider collaboration (Group C: no-collaboration/no-consideration group).

Data analysis

First, we described characteristics of the participating fire defense headquarters based on the number of overall staff

and emergency medical technicians (EMTs). Second, we created a 3 × 3 contingency table to examine the association between population density categories (low, medium, high) and responses regarding collaboration with community organizations. Given the absence of a universally accepted method to categorize population density, we divided it into tertiles, classifying areas as low (7–106 people/km^2), medium (107–440 people/km^2), and high (441–12,061 people/km^2) density. Continuous variables are summarized using median values, interquartile ranges (IQRs), and minimum and maximum values. Categorical variables are presented as numbers and proportions (%) of the corresponding cases.

The qualitative descriptive method was used by the first author (K.U.) to analyze free-text data,[21] which were translated from Japanese to English. Data were categorized into codes and assessed and compared to determine content overlap and similarity. Subsequently, codes were classified into themes based on similarities and differences. All authors discussed and reviewed transcribed data and themes to establish credibility and trustworthiness.

We used STATA SE V.18.0 (Stata Corp., College Station, Texas, USA) for quantitative analyses and MAXQDA 2024 (VERBI GmbH, Berlin, Germany) for free-text data analysis.

TABLE 1 Summary of survey items.

Demographics
1. Overall number of staff 2. Number of nationally certified emergency medical technicians
Collaboration with community organizations
Group A: collaboration group
1. Collaborating organizations and departments (multiple choices) 2. Examples of collaboration (free-text answer) 3. Challenges encountered during collaboration (free-text answer)
Group B: no-collaboration/underconsideration group
1. Organizations and departments they are considering collaboration with (multiple choices) 2. Expected challenges during collaboration (free-text answer).
Group C: no-collaboration/no-consideration group
1. Reasons for not considering collaboration (free-text answer)

Note: Participants' names were collected to avoid duplicate responses and confirm the content of the information.

RESULTS

A total of 529 fire defense headquarters participated in the survey and were included in the analysis (response rate: 72.9%).

Fire defense headquarters characteristics

Of 529 participating fire defense headquarters, 445 (84.1%) were included in Group A, 18 (3.4%) in Group B, and 66 (12.5%) in Group C (Table 2). The distribution of population density among the participating fire defense headquarters is presented in Figure S1 (Appendix S2). The median population density was 219.5 people/km^2 (IQR: 68.5–685 people/km^2) with a minimum of 7 people/km^2 and a maximum of 12,061 people/km^2. The chi-square test revealed a statistically significant association between population density and responses regarding collaboration with community organizations ($\chi^2 = 9.53$, df = 4, $p = 0.049$; Table 3).

Types of organizations and municipal departments with which fire defense headquarters collaborated (Group A) and considered collaboration (Group B)

In Group A, the fire defense headquarters most commonly collaborated or were collaborating with public health centers (62.5%), community comprehensive support centers (54.6%), and municipal departments of long-term care (40.0%). In Group B, the organizations considered for collaboration were elderly residential facilities (72.2%), community comprehensive support centers (50.0%), and home-visit nursing offices (44.4%) (Table 4).

Examples of collaboration by fire defense headquarters (Group A)

Some examples of collaboration were as follows: collaboration with public health centers regarding the coronavirus disease 2019 (COVID-19) pandemic, requesting support for patients who frequently use an ambulance to community

TABLE 2 Characteristics of the participating fire defense headquarters.

	Responses regarding collaboration with community organizations											
	Group A (N = 445)				Group B (N = 18)				Group C (N = 66)			
	Median	IQR	Min	Max	Median	IQR	Min	Max	Median	IQR	Min	Max
Overall staff	115	73–207	11	18,684	109	68–218	37	1596	103.5	50–194	13	1210
EMTs	38	25–61	4	2590	37.5	24–66	14	385	37.5	22–56	7	365

Note: Group A: Collaboration group, Group B: No-collaboration/underconsideration group, Group C: No-collaboration/no-consideration group.
Abbreviations: EMTs, emergency medical technicians; IQR, interquartile range; Min, minimum; Max, maximum.

TABLE 3 Cross-tabulation of responses regarding collaboration with community organizations, stratified by population density ($n = 528$).

Population density	Responses regarding collaboration with community organizations		
	Group A, *n* (%)	Group B, *n* (%)	Group C, *n* (%)
Low	139 (31.3)	6 (33.3)	31 (47.0)
Medium	156 (35.1)	3 (16.7)	17 (25.8)
High	149 (33.6)	9 (50.0)	18 (27.3)

Note: One fire defense headquarters was excluded from the analysis owing to missing name information, resulting in unavailable population density data. Group A: Collaboration group, Group B: No-collaboration/underconsideration group, Group C: No-collaboration/no-consideration group. Population density categories: Low = 7–106 people/km^2; Medium = 107–440 people/km^2; High = 441–12,061 people/km^2.

TABLE 4 Types of organizations and municipal departments with which fire defense headquarters collaborated (Groups A) and considered collaborating (Group B).

Types of organizations and municipal departments	Group A ($N = 445$)		Group B ($N = 18$)	
	n	%	*n*	%
Home-visit nursing office	108	24.3	8	44.4
Office to provide outpatient day long-term care	72	16.2	6	33.3
Office to provide short-term admission for daily life long-term care	67	15.1	6	33.3
Elderly residential facility[a]	141	31.7	13	72.2
Community comprehensive support center	243	54.6	9	50.0
Municipal department of long-term care	178	40.0	7	38.9
Welfare office (Municipal department of welfare)	156	35.1	7	38.9
Council of welfare volunteers and child welfare volunteers	59	13.3	1	5.6
Municipal department of welfare for persons with disabilities	70	15.7	3	16.7
Child guidance center	36	8.1	1	5.6
Council of social welfare	129	29.0	6	33.3
Municipal health center	81	18.2	2	11.1
Public health center	278	62.5	6	33.3
Mental health and welfare center	30	6.7	1	5.6
Municipal department of health	177	39.8	7	38.9
Others	52	11.7	2	11.1

Note: Some of the participants provided multiple responses to this question; thus, the total percentages exceeded 100. Group A: Collaboration group, Group B: No-collaboration/underconsideration group.

[a]Including public facilities (special long-term care home, elderly care health facility, etc.) and private facilities (assisted living facilities for older people, service-enhanced housing for older people, etc.).

comprehensive support centers, collaboration with municipal departments of long-term care and health, and operating a patient information-sharing tool with residential facilities for older adults (Table S1 in Appendix S3).

TABLE 5 Challenges faced by fire defense headquarters (Group A) when collaborating with organizations and municipal departments (free description).

Opinions	*n*
None	117
Cannot contact organizations during nights and holidays	105
Cannot obtain patient information from organizations due to privacy reasons	30
Delayed responses by organizations	24
Difficulty establishing and continuing collaboration with organizations	24
Need for mutual understanding of tasks	21
Differing understanding and handling of DNAR and ACP	19
Problems may not be resolved through collaboration	18
Difficulty ensuring an information-sharing system with organizations	13
Lack or insufficient patient information updates on the information-sharing sheet	12
Difficulty identifying the responsible contact point	12
Refusal by staff of organizations to accompany patients to medical institutions	10
Insufficient sharing and disseminating information about collaborative efforts within organizations	10
A lot of time needed to coordinate discussions with organizations	9
Differing collaborative efforts among organizations	9
Difficulty determining the appropriate organizations for collaboration	8
Cannot obtain an understanding and cooperation regarding collaboration from patients or their families	6
Shortage of personnel in organizations	5
Differences in organization's responses	4
Difficulty gathering opinions	3
Burden for paramedics	3
Do not know who takes responsibility	2
Organizations are busy with their work.	2
Lack of feedback from organizations after support interventions	2
Lack of interaction with organizations	2
Irrelevant answers: The answers did not address the difficulties of cooperation.	28
Others	2

Note: Some of the participants provided multiple responses to this question.

Abbreviations: ACP, advance care planning; DNAR, do not attempt resuscitation.

Collaboration challenges faced by fire defense headquarters (Group A)

A total of 445 fire defense headquarters provided responses, with 117 reporting no challenges. The most common challenge was "cannot contact organizations during nights and holidays" ($n = 105$), followed by "cannot obtain patient information from organizations due to privacy reasons" ($n = 30$), "delayed responses by organizations" ($n = 24$), "difficulty

TABLE 6 Challenges for consideration by fire defense headquarters (Group B) when collaborating with organizations and municipal departments (free description).

Opinions	*n*
Issues related to patients' personal information	5
Lack of opportunities for discussions with organizations	4
Need for mutual understanding of tasks	2
Different perspectives on emergency medical services	2
Others	9

Note: Some of the participants provided multiple responses to this question.

TABLE 7 Reasons why fire defense headquarters (Group C) did not consider collaboration with organizations or municipal departments (free description).

Opinions	*n*
None of the cases required collaboration	30
(No opinions were received)	14
Issues related to patients' personal information	7
Difficulty in establishing a collaboration system	5
No opportunities for collaboration	3
No need for collaboration	3
Others	5

Note: Some of the participants provided multiple responses to this question.

establishing and continuing collaboration with organizations" ($n = 24$), and "need for mutual understanding of tasks" ($n = 21$) (Table 5).

Collaboration challenges for consideration by fire defense headquarters (Group B)

In total, 18 facilities provided responses. Identified challenges included "issues related to patients' personal information" ($n = 5$), "lack of opportunities for discussions with organizations" ($n = 4$), "need for mutual understanding of tasks" (n = 2), and "different perspectives on emergency medical services" (n = 2) (Table 6).

Reasons for no collaborations by fire defense headquarters (Group C)

A total of 66 fire defense headquarters provided responses, but 14 did not provide an opinion. The most common reason for lack of collaboration was "none of the cases required collaboration" ($n = 30$). Other reasons included "issues related to patients' personal information" ($n = 7$), "difficulty in establishing a collaboration system" ($n = 5$), "no opportunities for collaboration" ($n = 3$), and "no need for collaboration" ($n = 3$) (Table 7).

DISCUSSION

This is the first nationwide study to evaluate the current state and challenges of multidisciplinary collaboration between fire defense headquarters and long-term care, welfare, and health organizations in Japan. We observed that 84.1% of fire defense headquarters collaborated with these community organizations, despite encountering various challenges.

The fire defense headquarters most frequently collaborated with public health centers, as indicated by the establishment of cooperative frameworks during the COVID-19 pandemic (from early 2020 to May 2023).[22] Furthermore, fire defense headquarters commonly collaborated with community comprehensive support centers and municipal departments of long-term care and health. Together with findings from the examples of collaboration (Table S1 in Appendix S3), these results reveal the essential role of fire defense headquarters in facilitating the sharing of patient information and addressing the needs of people who frequently use an ambulance. Interestingly, the most common organizations with which the fire defense headquarters considered collaboration included elderly residential facilities and home-visit nursing offices, although these organizations were not listed among those with which the fire defense headquarters commonly collaborated. This finding suggests difficulty in collaborating with private organizations, owing to challenges on "issues related to patients' personal information."

Some fire defense headquarters reported no challenge in collaboration, suggesting fairly smooth collaboration with community organizations. However, the most common challenges encountered by the other fire defense headquarters were "cannot contact organizations during nights and holidays" and "delayed responses from organizations." Similarly, those who did not collaborate, but considered to collaborate, identified "issues related to patients' personal information" as a potential hindrance to their collaborative efforts. Although fire defense headquarters operate on a 24-h basis, some community organizations are unable to deliver services at night or on holidays, or if they can, they face difficulties owing to insufficient staffing. To address this issue, the fire defense headquarters could manage an online system for sharing patient information established at medical and long-term care facilities; acquire patient data from health insurance registration cards (also referred to as "My Number Cards"), currently being operated as a demonstration project;[23] and consult with other institutions during weekday daytime hours.

The fire defense headquarters that were considering collaboration also highlighted additional challenges, such as "lack of opportunities for discussion with organizations," "need for mutual understanding of tasks (also frequently noted by fire defense headquarters that had collaborated with community organizations)," and "different perspectives on emergency medical services." These challenges emphasize

the need to create platforms for information exchange and dialog to enhance collaboration. For example, multidisciplinary conferences (*tiiki-care-kaigi* in Japanese) can serve as suitable platforms for nurturing and fostering cooperation among professionals from various disciplines.[24,25] Through case discussions, the professionals can foster visible and interpersonal relationships. Moreover, the conferences offer an opportunity for mutual understanding and insight into each other's roles and responsibilities.

The primary reasons why some fire defense headquarters did not consider collaboration with community organizations were "none of the cases required collaboration," suggesting that they may encounter a few, if any, issues that cannot be resolved on their own. However, some fire defense headquarters did not give a reason for their response, implying that this question may have been difficult for some participants to understand.

Although the role of EMS personnel has been expanding to non-acute care situations, they are primarily trained to respond to high-acuity medical emergencies and to quickly transport patients to the hospital. A qualitative Canadian study reported that EMS personnel often experience "role confusion" and decry insufficient knowledge for patients who do not require an ED visit, but rather need long-term support to address unmet social or medical needs when participating in community - based referral programs.[26] In Japan, the increasing complexity of healthcare needs and the aging population continue to strain the healthcare system. The establishment of a community-oriented integrated care system and a community-based inclusive society has been promoted in the past decade. Stakeholders should continue fostering collaboration in the community, identifying challenges in these collaborations, and gathering examples of best practices and difficult cases. These efforts will help define the role of fire defense headquarters within local collaborative frameworks. Additionally, the expansion of EMS roles highlights the need for comprehensive training and protocols for managing acute and non-acute care situations.

Limitations

This study has some limitations. First, although the response rate was 72.9%, potential selection bias among respondents may have affected the study results. In particular, fire defense headquarters that did not collaborate with community organizations (Groups B and C) may have been less likely to participate. Second, since this was a cross-sectional study undertaken in a single year, the current state of collaboration may differ from the reported one. In the future, we plan to conduct a follow-up survey to examine changes in collaborative efforts. Third, information bias may have existed because fire defense headquarters may have interpreted the status of collaboration with community organizations differently. Nevertheless, we designed the questionnaire to be as comprehensive and easy to answer as possible, and we obtained feedback from fire defense headquarters staff to ensure the clarity and relevance of the included items. Fourth, the results may not be generalizable because not all fire defense headquarters in Japan participated in the study, and the need for collaboration between them and with community organizations may vary by region. Finally, some of the responses from the fire defense headquarters operated by multiple municipalities (the so-called regional fire defense headquarters) may not accurately reflect the state of collaboration at each municipality within their jurisdiction.

CONCLUSION

The results of this nationwide survey revealed multidisciplinary collaboration between the majority of fire defense headquarters and long-term, welfare, and health organizations in the community in Japan, although some challenges hindered smooth collaboration. Fire defense headquarters and community organizations should continue fostering collaboration in the community, addressing challenges in these collaborations, and gathering examples of good practices and difficult cases, which will be instrumental in defining the role of fire defense headquarters within local collaborative frameworks.

ACKNOWLEDGEMENTS

We would like to thank the fire defense headquarters who participated in this study. We wish to thank Cross Marketing Inc. (https://www.cross-m.co.jp/en/) for distributing the web-based survey and collecting data. This work was supported by Kyukyushinkou Zaidan (grant number: N/A) and the Japan Society for the Promotion of Science (JSPS) under KAKENHI Grant numbers (22K21081, 23K16326, and 23H03228). These funding bodies had no responsibility for or involvement in the development of the study protocol, analysis, interpretation of the results, or submission of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Partial or complete datasets and data dictionaries are available from the authors upon request, subject to investigators providing an institutional review board letter of approval.

ETHICS STATEMENT

Approval of the research protocol: The protocol for this research has been approved by the Ethics Committee of the Graduate School, and the Faculty of Medicine of Kyoto University approved this study (approval no.: R3924). The authors certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed consent: Participants agreed to take part in the study by submitting their responses to the questionnaire.

Registry and the registration no. of the study/trial: N/A.
Animal studies: N/A.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Ueno K, Nishioka D, Teramoto C. Current state and challenges of multidisciplinary collaboration by fire defense headquarters in Japan: A nationwide cross-sectional survey. Acute Med Surg. 2025;12:e70067. https://doi.org/10.1002/ams2.70067