Pre- and Post-home Visit Behaviors using an after-hours House Call (AHHC) Medical Services: A Questionnaire-based Survey in Tokyo, Japan

Ryota INOKUCHI (✉ intensivecareunits@gmail.com)

University of Tsukuba

Kojiro MORITA

University of Tsukuba

Xueying JIN

University of Tsukuba

Masatoshi ISHIKAWA

University of Tsukuba

Nanako TAMIYA

University of Tsukuba

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Abstract

Background: To reduce the burden caused by emergency department (ED) visits and ambulance use, after-hours house call (AHHC) medical services have been implemented. Examining the pre-and post-home visit behaviors of those who use AHHC medical services, stratified by age and illness severity, may help determine the populations these services should target effectively to reduce ED visits and ambulance use.

Methods: This questionnaire-based study used data from anonymized medical records and internet-based questionnaires completed by patients who used AHHC medical services in Tokyo, Japan, between January 1 and December 31, 2019. The questionnaire consisted of two questions: what action would the patient have taken in the absence of AHHC services, and what action was taken within three days following the use of the AHHC services.

Results: Of the 15,787 patients who used AHHC medical services during the study period, 2,128 completed the questionnaire (13.5% response rate). Individuals aged <15 years and 16–64 years were the most common users of AHHC services (≤ 15 years, 71.4%; 16–64 years, 26.8%). Before using the AHHC service, the majority of patients in each patient age group would have visited the ED if the AHHC service had not been available (≤ 15 years, 47.8%; 16–64 years, 42.8%; ≥ 65 years, 43.6%), and the proportion of patients originally planning to call an ambulance was higher among those in higher age groups (≤ 15 years, 1.1%; 16–64 years, 6.0%; ≥ 65 years, 20.5%). After using AHHC services, the majority of patients (68.1%) did not visit a hospital within three days, but the proportion of patients who visited an ED and called an ambulance within that time increased as their illness severity increased.

Conclusions: Increasing AHHC medical services awareness among older adults and encouraging repeated use of AHHC services for patients with severe illnesses may help reduce ED visits and ambulance use.

Background

Non-urgent emergency department (ED) visits and ambulance calls are now global issues [1]. ED crowding and increased transport times have not only led to patients being disadvantaged but also increased the burden on health care providers [2]. Recently, several countries have developed after-hours house call (AHHC) medical services or out-of-hours services (OOH) to solve the problems of excessive ED visits and ambulance use [3]. Under the AHHC services, physicians visit patients in their houses after hours, thereby reducing the number of ambulance dispatches and ED visits [4–8].

In Japan, to reduce non-urgent ED visits and ambulance use, telephone consultation services and educational activities to promote appropriate ambulance use were introduced in 2007 [9]; regardless, the number of ambulance calls and the duration of transportation have continued to increase [10]. As part of Japan's universal health care system, patients with emergency health problems can call an ambulance free of charge, and 97.9% of callers receive ambulance transportation to emergency hospitals [11]. Recently, charging for the ambulance services has been considered [12], but an acceptable solution has not yet been implemented.

In 2016, a private AHHC service was established in Tokyo, Japan. This AHHC service provides consultations and triages via telephone to patients needing medical attention after regular hospital visiting hours. Subsequently, the number of companies offering similar services has been increasing.

Examining the pre-and post-home visit behaviors of those who use AHHC medical services, stratified by age and illness severity, could help identify the population(s) these services should target to reduce ED visits and ambulance use. However, previous studies have not examined the impact of AHHC service use by age and disease severity. Thus, we investigated these behaviors in patients using Tokyo's AHHC medical service by using patient data and patient-completed questionnaires.

Methods

This study used data obtained from anonymized medical records and internet-based questionnaires which were completed by patients who used AHHC medical services between January 1 and December 31, 2019. The study was reviewed and approved by the Research Ethics Committee of the University of Tsukuba (approval number, 1527).

Data Sources

In this study, the anonymized clinical records of all patients who had used the AHHC services during the study period were reviewed, along with the questionnaires completed by them. Information regarding patient sex, age, and illness severity were extracted from the medical records. The questionnaire consisted of two questions: what action would the patient have taken in the absence of AHHC services (stay home, wait for consultation until a hospital opens, visit ED, or call an ambulance) and what action was taken within three days following the use of the AHHC services (no hospital visit, visited an outpatient clinic, visited an ED, received another house call, or called an ambulance) (Supplemental File).

Japan's Health Care System

Emergency hospitals in Japan are categorized as primary, secondary, or tertiary [13]. Generally, for primary care, holiday and night-time EDs are available for non-severe conditions. Secondary hospitals provide emergency first aid for patients and, if necessary, inpatient care. Tertiary hospitals provide tertiary emergency medical and advanced critical care [14, 15].

Under Japan's universal health care system, ambulatory patients have free access to any hospital facility, regardless of their symptoms [16]. This is because Japan has not established a general practitioner system, like in Europe. Furthermore, anyone can call an ambulance service, without any expenditure [17]. If an ambulance is called, patients are transported to a secondary or tertiary hospital, depending on the severity of their condition.

AHHC Medical Services in Japan

A private AHHC medical service (Fast Doctors, Shinjuku, Tokyo, Japan), covered by Japan's universal health care system, has been operating in Tokyo since 2016. Patients can access the service via direct phone call, or can request a consultation online. The company operates seven days/week outside of regular hospital visiting hours (i.e., 19:00-06:00 on weekdays, 18:00-06:00 on Saturdays, and 24 hours/day on Sundays and holidays). The AHHC services have about 4-12 doctors/shift.

Following a telephone triage, instead of sending an ambulance, the service sends a doctor directly to the patient's residence. The telephone triage involves a patient calling an emergency telephone consultation service and being classified into one of five categories (red, orange, yellow, green, or white), based on symptom acuity. The red category implies the presence of a life-threatening condition or one that is likely to worsen or change rapidly; orange reflects a condition requiring immediate hospital attendance, as the symptom(s) may worsen over time; yellow requires a hospital visit as the symptom(s) may worsen over time; green does not have symptoms listed in the previous categories but requires a hospital visit; and white reflects symptoms that do not require a hospital visit [9].

After the telephone triage, the AHHC service doctors perform home visits for patients classified as orange and yellow. Following the consultation, the doctor assesses the illness severity (mild, moderate, or severe); mild illnesses are those that can be treated using over-the-counter medications, moderate illnesses require the patient to visit a hospital or clinic, and severe illnesses require ambulance transportation.

Statistical Analysis

We compared the patient characteristics (age, sex, and illness severity) between questionnaire responders and non-responders. As appropriate, Pearson's chi-square test or Fisher's exact test were used to compare categorical variables, and Student's t-test or the Wilcoxon-Mann-Whitney test were used to compare continuous variables. Analyses were performed using JMP 14.3 statistical software (SAS Institute, Cary, NC, USA) and a value of $p < 0.05$ was considered statistically significant.

Results

Of the 16,067 patients who received AHHC medical services during the study period, we excluded 280 owing to missing responses. Of the remaining 15,787 patients, 2,128 returned completed questionnaires (13.5% response rate).

Characteristics of Responders and Non-Responders

Patients who completed the questionnaires were younger than the non-responders (6 years [IQR 2, 25] vs. 7 years [IQR 2, 30], $p < 0.001$) and had less severe symptoms than the non-responders ($p = 0.012$) (Table 1). Patients ≤ 15 years and those 16–64 years were the most common users of the AHHC service. There were no differences in sex ratio between the age groups.

Table 1
Characteristics of responder and non-responder patients

	Responders (N = 2128)	Non-responders (N = 13,659)	p-value
Age (years), median [IQR]	6 [2, 25]	7 [2, 30]	<0.001
Age group, N (%)			
			<0.001
≤15 years	1519 (71.4)	8237 (60.3)	
16–64 years	570 (26.8)	5159 (37.8)	
≥65 years	39 (1.8)	263 (1.9)	
Sex			0.67
Male (%)	1014 (47.7)	6578 (48.2)	
Severity (%)			0.012
Mild	1253 (58.9)	7627 (55.8)	
Moderate	865 (40.7)	5926 (43.4)	
Severe	10 (0.5)	106 (0.8)	
IQR, interquartile range			

Probable Actions in the Unavailability of AHHC Service

The proportion of patients originally planning to call an ambulance was 46.4%. In each age group, the majority of patients reported visiting EDs because AHHC services were not available (≤15 years, 47.8%; 16–64 years, 42.8%; ≥65 years, 43.6%). Table 2 also indicates that as the age group increased, the proportion of patients who would have called an ambulance also increased (≤15 years, 1.1%; 16–64 years, 6.0%; ≥65 years, 20.5%).

When stratified by illness severity (Table 2), the proportion of those who had planned to call an ambulance increased with increasing illness severity (mild, 2.1%; moderate, 30.2%; severe, 40.0%), while the proportion of those who had planned to stay home decreased with increasing illness severity (mild, 54.7%; moderate, 45.8%; severe, 10.0%). There was no significant difference of action between sexes ($p=0.14$).

Table 2
Actions taken if the after-hours house call (AHHC) services had been unavailable

	Stayed home	Waited for a consultation until a hospital opened	Visited the emergency department	Called an ambulance
All patients, N (%)	208 (9.8)	875 (41.1)	987 (46.4)	58 (2.7)
Age group				
≤15 years (N = 1519)	132 (8.7)	645 (42.5)	726 (47.8)	16 (1.1)
16–64 years (N = 570)	73 (12.8)	219 (38.4)	244 (42.8)	34 (6.0)
≥65 years (N = 39)	3 (7.7)	11 (28.2)	17 (43.6)	8 (20.5)
Severity				
Mild (N = 1253)	143 (11.4)	543 (43.3)	541 (43.2)	26 (2.1)
Moderate (N = 865)	65 (7.5)	331 (38.3)	441 (51.0)	28 (3.2)
Severe (N = 10)	0 (0)	1 (10.0)	5 (50.0)	4 (40.0)

Behavior Within Three Days of using AHHC Service

The 2,128 patients who provided answers indicated that, within three days of using the AHHC service, most did not visit a hospital (68.3%); however, some visited an outpatient clinic (27.0%) or an ED (2.8%), and some used daily home-visits (1.0%) or called an ambulance (0.8%) (Table 3).

Table 3

Patient actions during the three days following the use of the after-hours house call service (AHHC), based on both the expected initial action if the service had not been available and on illness severity.

		After using the AHHC service				
		Did not visit a hospital	Visited an outpatient clinic	Used a daily home-visit	Visited an emergency department	Called an ambulance
Expected response before using the AHHC service	All (N = 2128)	1453 (68.3)	575 (27.0)	60 (2.8)	22 (1.0)	18 (0.8)
	Remained at home (N = 208)	158 (76.0)	39 (18.8)	3 (1.4)	6 (2.9)	2 (1.0)
	Waited for a consultation until a hospital opened (N = 875)	602 (68.8)	250 (28.6)	9 (1.0)	10 (1.1)	4 (0.5)
	Visited an emergency department (N = 987)	662 (67.1)	270 (27.4)	7 (0.7)	41 (4.2)	7 (0.7)
	Called an ambulance (N = 58)	31 (53.4)	16 (27.6)	3 (5.2)	3 (5.2)	5 (8.6)
Illness severity	Mild (N = 1253)	853 (68.1)	355 (28.3)	10 (0.8)	26 (2.1)	9 (0.7)
	Moderate (N = 865)	598 (69.1)	218 (25.2)	11 (1.3)	32 (3.7)	6 (0.7)
	Severe (N = 10)	2 (20.0)	2 (20.0)	1 (10.0)	2 (20.0)	3 (30.0)

When stratified by their intended action before using the AHHC service, the proportion of patients who did not visit hospitals within three days of their AHHC visit decreased in the following order: staying at home (76.0%), waiting for a consultation (68.8%), visiting an ED (67.1%), or calling an ambulance (53.4%). Further, when stratified by illness severity, the proportions of patients with severe illnesses who visited EDs (20.0%) or called ambulances (30.0%) within the three-day period were similar or higher.

Discussion

The present study found that 1) the proportion of patients who had originally planned to visit an ED was >40% in each age group, 2) the proportion of patients who had originally planned to call an ambulance increased with patient age, and 3) the proportion of those who visited an ED or called an ambulance within three days of using the AHHC service were low; however, the proportion of patients who visited an ED or called an ambulance within that time increased as their illness severity increased.

Although several papers have reported analyses of patient factors or behaviors leading to the call for an ambulance, this is the first to describe patient behaviors before and after using the AHHC medical services

stratified by age and illness severity.

Probable Patient Actions in the Absence of AHHC Service

The present study showed that 46.4% of respondents would have visited an ED if the AHHC service had not been available. This result is similar to the 43% reported in a Dutch study [18] and the 40.1% reported in an Australian study [19]. Additionally, we found that after using the AHHC service, majority of the responding patients (68.1%) reported not visiting a hospital within the following three days; 2.8% visited an ED and 0.9% called an ambulance within that time period. Similarly, an Australian study showed that, after an AHHC visit, 40% of patients did not require a follow-up and 8.4% of patients visited an ED [19]. Other studies have also reported declines in ED visits following the introduction of the AHHC services [20-23]. These findings indicate that AHHC services have reduced the number of ED visits and the number of ambulance calls.

Patient Age and Ambulance Calling Plans

We found that the proportion of those who had planned to call ambulances, prior to contacting AHHC service personnel, increased with age. Previous national and international studies have shown that older adults are more likely to call an ambulance than younger persons [17, 24-26] and that older adults disproportionately rely on ambulances to transport them to the ED [27], supporting our results.

In addition, in the present study, patients ≤ 15 years and those aged 16–64 years were the most common users of the AHHC service. Other studies have reported similar findings. For example, in Greece, a 10-year longitudinal study showed a gradual increase in the proportion of patients >75 years using a private AHHC service [4]; a private AHHC medical service in the US reported that $>90\%$ of the patients using the AHHC were <75 years [28]; and new, unadvertised after-hours units in the UK have also reported similar results [29]. While public AHHC services have existed for a long time in France, approximately 30% of their clients are children <15 years and only 16% are >65 years [30]. These findings suggest that the use of private AHHC services may demonstrate a delayed uptake because the patients are required to search the internet for the information necessary to contact the service. In Japan, a 2014 government white paper reported that the proportion of individuals aged 20-59 years who used the internet was $>91\%$, but this proportion declined sharply among people aged >60 years; the proportion of internet users who were >75 years was $<50\%$ [31]. Thus, as a society ages and the number of older adults with internet access increases, the availability of AHHC services may curtail ED visits and ambulance use. Moreover, as in other countries, if Japan's AHHC services are integrated into the public emergency call services and the operators are able to request AHHC services, the ability of AHHC services to effectively reduce ED visits and ambulance calls may be faster.

Behavior Within Three Days of Using AHHC Services

We found that the proportions of patients visiting an ED and calling an ambulance after using the AHHC medical service were higher among those with severe conditions and among those who had originally planned to visit an ED or call an ambulance. Several studies targeting patients who called an ambulance have reported that the patients who felt high levels of urgency would call an ambulance even for minor illnesses [32]. Therefore,

anxious patients may visit an ED or call an ambulance even after using an AHHC service. In contrast, we found that 40% of patients classified as severely ill would have elected to remain at home, or waited until their hospital was open before seeking consultation, if the AHHC medical service had not been available. This suggests that AHHC services may provide interventions before illness severity becomes too severe. To prove this hypothesis, a survey should be carried out for patients with severe conditions who used an ambulance, and to see whether they would use the AHHC service if it were provided.

Limitations

There were some limitations to the current study. First, our study involved only a single AHHC medical service. However, this AHHC service provides more than 18,000 nightly visits annually and is the largest after-hours emergency service in Japan. Second, prior to dispatching an AHHC physician, all AHHC service providers provide telephone triage to determine whether immediate ambulance attendance is required, which may cause a selection bias. Third, the response rate for the questionnaire part of the study was relatively low; thus, this study may have a potential sample selection bias. Finally, while the AHHC reduced the number of patients who had originally planned to visit an ED, patients who planned to stay at home and wait for a consultation until a hospital opened may have used the AHHC service because it was available. Therefore, cost-effectiveness analysis will be needed in the future.

Conclusions

The current study supports previously published work indicating the benefits of AHHC medical services for curtailing ED visits and ambulance use. Further, the study indicates that increasing AHHC medical services awareness among older adults and increasing the use of AHHC services for revisiting patients with severe illnesses, after an initial AHHC service visit, may reduce ED visits and ambulance use. In addition, AHHCs may be useful for providing assistance before an illness becomes severe. Our findings may be helpful in driving government policy, especially for countries facing an aging society.

Abbreviations

after-hour house call (AHHC), emergency department (ED), interquartile range (IQR), out-of-hours service (OOH)

Declarations

Funding

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Consent for publication

Not applicable [individual-level data not included].

Acknowledgements

Not applicable.

Contributions

R.I., K.M., X.J., and N.T. conceived the study. R.I. performed statistical analyses and wrote the first draft of this study. K.M., X.J., M.I., and N.T. critically reviewed the manuscript. All authors contributed to the design, interpretation of results, and critical revision of the article for intellectually important content.

Ethics declarations

Ethics approval and consent to participate

The Research Ethics Committee of University of Tsukuba approved this study (approval number: 1527) and waived informed consent. All methods were performed in accordance with the relevant guidelines and regulations.

Availability of data and material

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Competing interests

1) RI's joint appointment as an associate professor and 2) KM's XJ's appointment as an assistant professor at the University of Tsukuba were sponsored by Fast DOCTOR Ltd. from October 2019 to the present. Fast DOCTOR Ltd. had no role in conducting this study. I.M. and N.T. have no conflict of interest.

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