

# Emergency visits for end-of-life patients receiving physician-led home care in Japan

## A retrospective observational study

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### Abstract

To clarify the patterns, reasons, and patient characteristics associated with emergency visits in the final 30 days of life for patients receiving home care in Japan. We conducted a retrospective analysis of emergency visits made by home care physicians to patients who died while receiving home care in 2018. Data on patient characteristics and emergency visits during the final 30 days of life were extracted from medical records. Poisson regression analysis was used to identify factors associated with emergency visit frequency. Among 83 end-of-life patients (median age 84 years, 49.4% male), a total of 86 emergency visits were recorded. These visits occurred most frequently in the days immediately preceding death, with 40.7% occurring within 5 days before death. Visits were more common during afternoons (37.2%) and weekends (39.6%). The primary reasons for visits included respiratory distress (20.9%), clinical assessment (14.0%), and neurological symptoms (12.8%). While some visits resulted in medication prescriptions (26.7%) or laboratory tests (22.1%), 36.1% involved observation only. Multivariable analysis revealed that longer duration of home care was associated with increased emergency visit frequency (31–365 days: relative risk [RR] 2.30, 95% confidence interval [CI]: 1.16–4.54; >365 days: RR 3.00, 95% CI: 1.56–5.78), while younger age was associated with increased visits ( $\leq 79$  years: RR 2.04, 95% CI: 1.19–3.47). Emergency home visits in the terminal phase often clustered near death and frequently resulted in observation only, suggesting that some visits may be driven more by caregiver anxiety than medical urgency. Additionally, care level appeared to play a limited role during this period. These findings highlight the need for proactive symptom management, caregiver support, and scalable approaches such as telehealth to optimize end-of-life care.

**Abbreviations:** CI = confidence interval, RR = relative risk.

**Keywords:** emergency medical services, home care services, house calls, Japan, terminal care

### 1. Introduction

Patient-centered care is a cornerstone of modern healthcare practice.<sup>[1]</sup> Different models of care have been developed to realize this approach. Home care is a type of medical service provided to patients in their own homes or residential facilities.<sup>[2]</sup> In countries such as Japan, home care has evolved to

meet the growing demand for out-of-hospital management, particularly for individuals with chronic conditions or those requiring end-of-life care. According to the Ministry of Health, Labor and Welfare of Japan, as of May 2023, approximately 1.0 million patients were receiving home care.<sup>[3]</sup> In the analysis of 277 home care patients referred to the clinic from 2017 to 2018, overall survival rates were 82.5% at 30 days and

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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39.1% at 3 years, with cancer diagnosis (hazard ratio 6.53) and advanced age (hazard ratio 1.01) emerging as significant predictors of mortality<sup>[4]</sup>. Currently, home care is recognized as a vital option in delivering patient-centered care, as it aligns with patients' values and preferences, especially those nearing the end of life.<sup>[5,6]</sup>

For patients with life-limiting conditions, the end-of-life phase is frequently marked by dynamic changes in various symptoms and clinical states. A systematic review of advanced or terminal illnesses revealed that over 50% of patients experienced physical symptoms, including pain, fatigue, anorexia, dyspnea, and worry.<sup>[7]</sup> In addition, psychological issues such as anxiety and depression were found to affect 30% to 50% of patients with advanced cancer in a previous study.<sup>[8]</sup> These psychological burdens exacerbate the challenges faced by an already vulnerable patient. While the decision to spend the end-of-life period at home with family may provide comfort, the underlying physical and psychological conditions must not be neglected.<sup>[9]</sup> Timely and appropriate interventions addressing evolving symptoms and conditions are essential for improving quality of life and minimizing suffering in end-of-life patients receiving home care.<sup>[10]</sup>

In home care settings, managing sudden changes in patients' conditions depends on the judgment of informal caregivers or healthcare professionals. Accurate detection of changes and urgency assessment are crucial for timely intervention. For minor changes or new symptoms, caregivers typically communicate with visiting nurses or home care physicians via phone or text, leading to nurse home visits.<sup>[11]</sup> More complex cases may require emergency physician visits or transfers to the emergency room. A Japanese study of 1 home care clinic reported 63 emergency cases involving 48 patients over 2 years, resulting in 5 deaths, 48 hospitalizations, and 10 patients returning home.<sup>[12]</sup> In addition, another previous research analyzed the factor on the frequency of the emergency visit. However, detailed data on emergency physician visits in the end of life phase in home care settings remain limited.

In this study, we analyzed emergency visits of physicians and clinic staff for end-of-life patients receiving home care. Our primary objectives were to determine: (1) the timing and reasons for emergency visits in the last 30 days of life, (2) the types of medical interventions required to resolve acute issues, and (3) the characteristics of patients who received emergency visits.

## 2. Methods

### 2.1. Study design, setting, and participants

This research is a retrospective, observational analysis of patient records from Orange Home-Care Clinic, a facility specializing in home care in Fukui Prefecture. Orange Home-Care Clinic provides home care to approximately 300 patients annually, with about 100 receiving end-of-life care.<sup>[12]</sup> Patients are primarily referred from general hospitals and clinics. We reviewed all recorded home care cases of patients who died between January 1 and December 31, 2018, including those who began receiving home care before 2018.

### 2.2. Japanese home care system

Under Japan's national health insurance system, residents who are no longer able to visit hospitals are eligible to receive home care services provided by a multidisciplinary team led by home care physicians. In Japan, home medical care services are provided to the following groups: patients who receive medical care while living in their own homes, residents of nursing homes or group homes, and eligible patients in special nursing care facilities.

At our clinic, a visiting team, typically comprising a physician and clinic staff, visits patients at their homes or residential facilities biweekly or monthly to provide medical care. Visiting nurses also deliver care, with visit frequency ranging from once weekly to daily, based on patients' conditions and preferences. When a patient with specific diagnoses such as terminal cancer and the condition becomes unstable, visit frequency can be increased up to four times a week to provide enhanced support.

### 2.3. Emergency visits

Home care consists of (a) scheduled visits by physicians, nurses, and other medical staff, and (b) emergency visits in response to urgent medical needs. Scheduled visits include regular and systematic examinations by a physician and accompanying staff, conducted weekly for terminal cancer patients or biweekly for other patients. In contrast, emergency visits enable patients and caregivers to consult with a physician as needed, addressing sudden or unexpected changes in the patient's condition. When patients or caregivers identify changes, they can contact a visiting nurse station or home care clinic, or request immediate transfer to the hospital for emergency services. Once a visiting nurse assesses the patient at their residence, the nurse reports the patient's condition to the clinic and indicates if further emergency visits are necessary. The home care clinic staff then evaluates the need for unscheduled visits based on reports from caregivers or visiting nurses. Additionally, visiting nurses can assess whether emergency transfer is required.

The frequency of emergency visits is determined by the patient's or caregiver's level of medical knowledge and understanding.<sup>[12]</sup> To minimize confusion, visiting nurse stations often receive calls directly from patients. Physicians provide caregivers with clear instructions on symptoms to monitor and advise them to contact the visiting nurse stations if any concerning symptoms arise.

### 2.4. Data collection

Data on patients' sociodemographic characteristics were extracted from medical records and other documentation, including sex, age at death, care level, availability of caregivers, primary disease, date of first examination at our clinic, predicted period before death (i.e., prognosis from the date of first attendance at the clinic), frequency of scheduled visits, number and dates of emergency visits within the 30 days prior to death, and date of death. Care level is an official measure in Japan that determines access to public care based on cognitive and physical functioning.<sup>[13]</sup> In Japan, the long-term care insurance system categorizes care needs into 7 levels. Support Level 1 (Yōshien 1) covers individuals needing minimal support with household chores and community activities, while Support Level 2 (Yōshien 2) requires slightly more assistance including some personal care. The care levels (Yōkaigo) range from Level 1, where individuals need regular assistance with basic activities of daily living but can walk independently, to Level 2 requiring moderate assistance with toileting and mobility, Level 3 needing substantial help with most personal care tasks, Level 4 involving extensive assistance with nearly all daily activities for often bedridden individuals, and Level 5, the highest level, designated for those completely dependent on caregivers for all activities and requiring round-the-clock care due to severe physical or cognitive impairments. However, this classification may not always accurately reflect patients' situations as it is based on physicians' written opinions assessing the patient at a specific point. Living environment was classified into 3 categories: (a) lived at home with a family member, (b) lived in a facility providing caregiving, and (c) lived at home alone. Primary diseases were classified according to the International Statistical

Classification of Disease and Related Health Problems 11th version (ICD-11). Only emergency visits within the last 30 days of life were included in the analysis. Final visits made to confirm death were excluded.

For each emergency visit, we collected data on the date and time of the visit, who requested the visit, who decided to conduct the visit, the reason for the request, and details of any medical treatments conducted during the visit. The “time of emergency visit” was defined as the time when the physician started examination, as extracted from the electronic medical record. The exact time when requests were received was not recorded; however, the average time interval between receipt of a request and the emergency visit was approximately 30 to 60 minutes for both physicians and nurses. Data regarding the time when the request was made and the physician’s decision to conduct the visit were not available.

The reasons for emergency visits were categorized as: changes in pain levels, fever, digestive problems, respiratory distress, disturbance of consciousness or paralysis, and inability to eat or drink, as reported by patients, caregivers, or visiting nurses. In cases where multiple symptoms were reported, all were documented. The individuals requesting emergency visits were classified as formal caregivers, informal caregivers, patients, others (such as neighbors), and the clinic (when the clinic independently judged the necessity of emergency visits).

In this study, we defined a “scheduled visit” as 1 scheduled for a home care physician each morning, while “emergency visits” were those that occurred outside of this schedule, as previously defined.<sup>[12]</sup> Specifically, we used emergency visits within the 30 days prior to death as a surrogate marker for end-of-life patients’ need for intervention by physicians. From these emergency visits, we omitted death confirmation visits in light of our study purposes. In Japan, a physician’s examination is required to confirm death. Therefore, if a patient receiving home care passes away at home, the home care physician is required to make an emergency visit.

## 2.5. Data analyses

The data for each emergency visit were analyzed descriptively. Then, eligible patients were categorized into 3 groups based on the number of emergency visits in the 30 days preceding their death: none, 1, or 2 or more. Fisher exact test was used to evaluate differences in the distribution between these groups.

Next, we examined the distribution and characteristics of emergency visits occurring within the final 30 days of life. Particular attention was paid to analyzing the types of medical interventions provided for different reasons for visits.

Subsequently, we conducted Poisson regression analysis to examine factors associated with the frequency of emergency visits in the last 30 days. The following categorical variables were included: sex (male, female), age ( $\leq 79$ , 80–89, and  $\geq 90$  years), care level certification status (certified or uncertified), living arrangement (with family or other), primary disease (cancer or non-cancer), and duration of home care ( $\leq 30$  days, 31–365 days, and  $> 365$  days). We first performed univariable regression analyses for all factors, followed by multivariable analysis. In the multivariable model, we used a backward elimination method, sequentially excluding factors with the highest *P*-value until all remaining factors showed statistical significance ( $P < .05$ ).

The appropriateness of the Poisson regression model was assessed using the Deviance Goodness-of-Fit test and Pearson Goodness-of-Fit test to evaluate model fit.<sup>[14,15]</sup> To check for overdispersion, the Pearson chi-squared statistic was divided by the degrees of freedom, with a ratio close to 1 indicating no significant overdispersion. Additionally, McFadden  $R^2$  was calculated to assess the model’s explanatory power. All statistical analyses were performed using Stata/MP 15.0 (Stata

Corporation, College Station) and Microsoft Excel Version 16.16.8 (Microsoft Corporation, Redmond).

## 2.6. Ethical review

This research adhered to the Ethical Guidelines for Medical and Health Research Involving Human Subjects. The study approval was granted by the Ethics Committee of the Medical Governance Research Institute on June 4, 2020 (MG2018-18-20200604). We obtained informed consent through opt-out process.

## 3. Results

### 3.1. Participant characteristics

Table 1 shows the sociodemographic characteristics of 83 end-of-life patients who died while receiving home care from the clinic in 2018, regardless of whether they received emergency home visits prior to death. Of the 83 patients, the majority were females (50.6%) aged 80 to 89 years (39.8%), in care level 5 (21.7%) who were diagnosed with cancer (55.4%), lived with family (78.3%) and had been in home care for 31 to 365 days (38.6%) prior to death which commonly occurred in autumn (32.5%).

### 3.2. Number and types of emergency visits within the last 30 days prior to death

During the study period, these patients received 1523 total visits, consisting of 1247 (81.9%) scheduled visits, 191 (12.5%) emergency visits, 83 (5.4%) death confirmation visits, and 2 (0.1%) visits with unknown purposes that occurred more than 30 days before death. For our analysis, we focused on 86 emergency visits (5.6% of 1523) that occurred within 30 days before death. Figure 1 shows the temporal distribution of 86 emergency visits that occurred during the last 30 days of life among all 83 patients. While emergency visits occurred throughout the 30-day period, their frequency increased markedly as patients approached death. Specifically, 51 visits (59.3%) and 35 visits (40.7%) occurred within 10 days and 5 days before death, respectively. Table 1 provides details of patients categorized into 3 groups according to the number of emergency visits in the last 30 days of life (0, 1, or 2 or more). Fisher exact test showed significant differences between groups in terms of duration of home care ( $P = .005$ ) and age ( $P = .003$ ). A longer duration of home medical care utilization and younger age were associated with a higher likelihood of experiencing 2 or more home visits in the final month of life.

### 3.3. Characteristics of emergency visits

Figure 1 shows the temporal distribution of 86 emergency visits that occurred during the last 30 days of life among all 83 patients. While emergency visits occurred throughout the 30-day period, their frequency increased markedly as patients approached death. Specifically, 35 visits (40.7%) occurred within 5 days before death, and 51 visits (59.3%) occurred within 10 days before death.

Table 2 analyzes 86 emergency visits during patients’ final 30 days. Most visits occurred in the afternoon (32 visits, 37.2%), followed equally by morning and evening periods (25 visits each, 29.1%). Weekend visits were most frequent (17 visits each on Saturday and Sunday, 19.8%). The primary reasons for visits were respiratory distress (18 visits, 20.9%). Visiting nurses initiated most visits (40 visits, 46.5%). While observation without intervention was common (31 visits, 36.1%), the most common intervention was medication prescriptions (23 visits, 26.7%). Multiple interventions could occur during a single visit.

**Table 1**

**Sociodemographic and clinical characteristics of patients receiving home care from a clinic in Fukui, Japan, according to the number of emergency visits in last 30 day.**

	Patients who died at home during home care	Patients who experienced 0 emergency visits (N = 30)	Patients who experienced 1 emergency visits (N = 33)	Patients who experienced 2 or above emergency visits (N = 20)	P-value (Fisher exact test)
Sex					.547
Male	41 (49.4)	17 (56.7)	14 (42.4)	10 (50.0)	
Female	42 (50.6)	13 (43.3)	19 (57.6)	10 (50.0)	
Age					.003
90–	22 (26.5)	10 (33.3)	6 (18.2)	6 (30.0)	
80–89	33 (39.8)	10 (33.3)	19 (57.6)	4 (20.0)	
70–79	16 (19.3)	5 (16.7)	4 (12.1)	7 (35.0)	
60–69	6 (7.2)	5 (16.7)	0 (0)	1 (5.0)	
50–59	4 (4.8)	0 (0)	4 (12.1)	0 (0)	
–50	2 (2.4)	0 (0)	0 (0)	2 (10.0)	
Level of the need for the care or support	18 (21.7)				.887
Not certified	3 (3.6)	6 (20.0)	7 (21.2)	5 (25.0)	
Support level 1/2	11 (13.3)	0 (0)	2 (6.1)	1 (5.0)	
Care level 1	9 (10.8)	6 (20.0)	3 (9.1)	0 (0)	
Care level 2	11 (13.3)	3 (10.0)	4 (12.1)	2 (10.0)	
Care level 3	13 (15.7)	4 (13.3)	5 (15.2)	2 (10.0)	
Care level 4	18 (21.7)	7 (23.3)	3 (9.1)	3 (15.0)	
Care level 5		4 (13.3)	9 (27.3)	5 (25.0)	
Availability of caregivers	65 (78.3)				.432
At home with family	12 (14.5)	23 (76.7)	25 (75.8)	17 (85.0)	
In residential facility	6 (7.2)	4 (13.3)	7 (21.2)	1 (5.0)	
Living alone		3 (10.0)	1 (3.0)	2 (10.0)	
Primary disease	46 (55.4)				.377
Cancer	17 (20.5)	21 (70.0)	16 (48.5)	10 (50.0)	
Dementia	5 (6.0)	4 (13.3)	8 (24.2)	5 (25.0)	
Orthopedic disease	4 (4.8)	0 (0)	2 (6.1)	3 (15.0)	
Respiratory disease	2 (2.4)	2 (6.7)	1 (3.0)	1 (5.0)	
Cerebrovascular disease	9 (10.8)	0 (0)	2 (6.1)	0 (0)	
Others		3 (10.0)	4 (12.1)	1 (5.0)	
Period of receiving home health care	27 (32.5)				.005
30 days or less	32 (38.6)	17 (56.7)	6 (18.2)	4 (20.0)	
31–365 days	24 (28.9)	10 (33.3)	14 (42.4)	8 (40.0)	
366 days or above		3 (10.0)	13 (39.4)	8 (40.0)	
Month of death	15 (18.1)				.482
Spring (March to May)	22 (26.5)	9 (30.0%)	5 (15.2%)	1 (5.0%)	
Summer (June to August)	27 (32.5)	6 (20.0%)	9 (27.3%)	7 (35.0%)	
Autumn (September to November)	19 (22.9)	9 (30.0%)	11 (33.3%)	7 (35.0%)	
Winter (December to February)		6 (20.0%)	8 (24.2%)	5 (25.0%)	

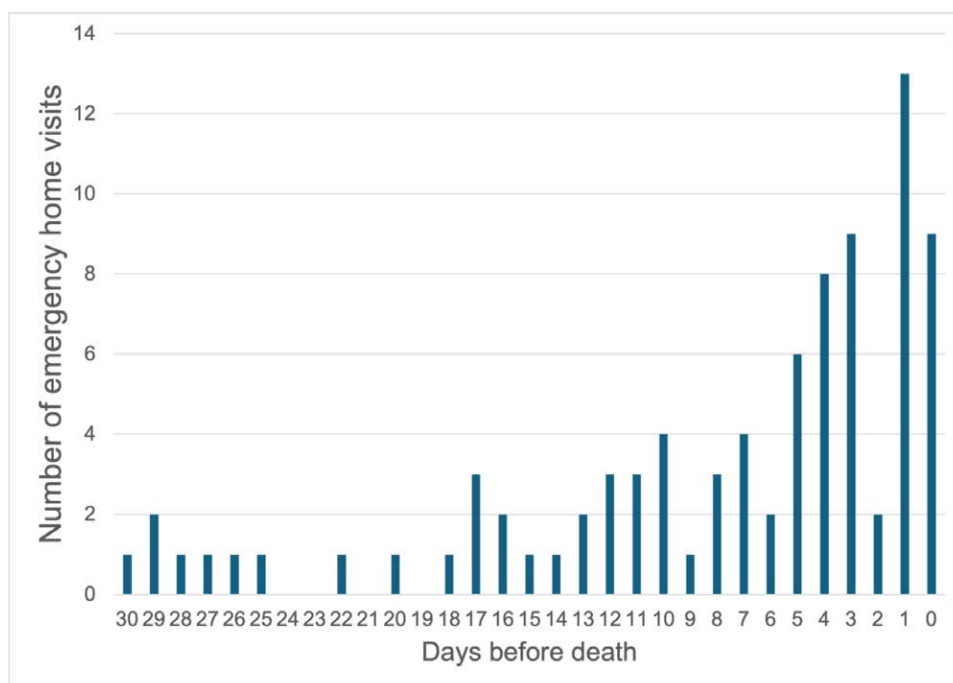
### 3.4. Primary reason for visit and interventions provided

Table 3 demonstrates the relationship between presenting symptoms and medical interventions provided during emergency visits. Most visits emergency visits were initiated by visiting nurses (40 visits, 46.5%) and family members (36 visits, 41.9%), on weekends (17 visits each on Saturday and 25 Sunday, 19.8%) in the afternoon (32 visits, 37.2%) primarily for respiratory distress (18 visits, 26 20.9%), for which the most common intervention was observation (31 visits, 36.1%). Multiple interventions could be provided during a single visit, explaining why percentages for each symptom category sum to more than 100%.

### 3.5. Factors associated with the number of emergency visits made prior to death

Table 4 presents the results of Poisson regression analyses examining factors associated with the frequency of emergency visits in the last 30 days of life. In the final multivariable model, 2 factors remained significantly associated with emergency visit frequency: duration of home care and patient age. Longer duration of home care was associated with increased frequency of emergency visits. Compared to patients receiving home care for 30 days or less, those receiving care for 31 to 365 days (adjusted relative risk:2.30, 95% confidence interval [CI]: 1.16–4.54) and more than 365 days (adjusted relative risk: 3.00, 95% CI:





**Figure 1.** The total number of unplanned home visits based on the days before death.

1.56–5.78) had significantly higher rates of emergency visits. Conversely, younger age was associated with increased emergency visit frequency, with patients under 80 years having approximately twice the visit rate of those aged 90 years or older (relative risk [RR] 2.04, 95% CI: 1.19–3.47). Other factors, including sex, care level certification, living arrangement, and primary disease, were not significantly associated with emergency visit frequency in the adjusted analysis.

### 3.6. Comparing the predicted to the actual number of emergency visits prior to death

The model showed acceptable fit based on both the Deviance Goodness-of-Fit (89.1,  $P = .18$ ) and Pearson Goodness-of-Fit (90.45,  $P = .20$ ) tests, indicating no significant lack of fit. Although the McFadden  $R^2$  value was relatively low at 0.077 ( $P < .001$ ), this is common in Poisson regression and does not suggest overfitting. To check for overdispersion, the Pearson chi-squared statistic was divided by the degrees of freedom, resulting in a ratio of 1.13, suggesting no significant overdispersion. These results demonstrate that the Poisson regression model is suitable for the data. The comparison of predicted and actual value was showed in the Supplementary Material 1, Supplemental Digital Content, <https://links.lww.com/MD/O940>.

## 4. Discussion

This study investigated the characteristics and clinical outcomes of emergency home visits among terminally ill home care patients in their final month of life. The findings revealed distinct temporal patterns, with visits clustering in the final days before death and peaking during weekends and afternoon hours. The reasons for visits were diverse, while a substantial proportion of visits resulted in observation without specific treatment. Poisson regression analysis identified longer duration of home care and younger age as factors associated with increased visit frequency, whereas the certified level of care dependency was not a significant predictor during the terminal phase.

In this study of home care patients in their final month of life, emergency home visits clustered in the days immediately preceding death, with 40.7% occurring within 5 days before death. This temporal pattern aligns with previous findings that intolerable physical symptoms typically appear approximately 2 days before death.<sup>[16]</sup> Our study extends these findings by demonstrating that such symptom progression translates into increased emergency home care visits during this critical period. These findings underscore the necessity of proactive symptom management and timely interventions to minimize distress and reduce the burden of emergency visits at the end of life.

Emergency visits occurred more frequently on weekends (39.6%) and during afternoon hours (37.2%). The weekend predominance might reflect heightened anxiety among family caregivers, who typically assume primary care responsibilities during weekends when professional healthcare workers are less available. The afternoon peak in visit requests could be attributed to caregivers monitoring symptoms throughout the morning before seeking medical attention, or to the accumulated time required for visiting nurses to assess situations and coordinate with physicians. There was no previous study that has examined the frequency of home visits based on time of day or day of the week based on the scope of our search. These patterns suggest opportunities for targeted resource allocation and highlight the importance of providing caregivers with clear guidance about symptom monitoring and emergency contact protocols. The clustering on weekends underscores the need for enhanced support during these critical times, including targeted staffing and caregiver assistance.

Emergency visits were prompted by diverse health issues ranging from nonspecific symptoms like fever to complex neurological manifestations such as altered consciousness. The second most common outcome of emergency home visits was medical prescription (26.7%), requiring physician assessment and clinical judgment, which underscores the necessity of in-person visits. While our study found respiratory distress (20.9%) as the most common reason for visits, previous research in Swedish residential care homes identified pain as the predominant symptom.<sup>[17]</sup> While the previous study has evaluated the proportion of patients experiencing symptoms, our study focused

on analyzing the reasons for emergency home visits. It is likely that many patients did experience pain; however, pain was effectively managed through as-needed analgesics or continuous opioid infusions. Patients were instructed to use these medications appropriately, allowing for adequate pain control without

requiring emergency home visits. The diverse range of presenting symptoms and the need for comprehensive clinical assessment aligns with previous research on end-of-life care needs.<sup>[18]</sup> Also, a significant proportion of emergency home visits were for evaluation and consultation without clearly defined symptoms. This suggests that psychosocial factors such as addressing caregivers' anxiety during the end-of-life period are also important aspects to consider.

Analysis of medical interventions revealed that a substantial proportion of emergency visits (36.1%) resulted in observation without specific medical treatment. This finding was particularly pronounced for visits primarily aimed at evaluation and consultation, where 75.0% required observation only. Such patterns suggest potential opportunities for alternative care delivery methods, such as telehealth services, to optimize physician workload. Previous systematic reviews have demonstrated the feasibility of telehealth in palliative home care,<sup>[19]</sup> and case studies from Japan have shown successful use of video consultations as alternatives to in-person emergency visits.<sup>[20]</sup> However, there are no previous studies in Japan that have discussed the use of telemedicine in palliative care. Fundamentally, it is likely that patients in the terminal stage prefer direct visits. Implementation of these technologies could be especially beneficial for cases requiring clinical assessment without hands-on interventions, potentially reducing the burden on home care physicians while maintaining quality of care.

The Poisson regression analysis revealed that duration of home care and age were independently associated with emergency visit frequency. Patients receiving longer-term home care showed significantly higher rates of emergency visits (RR 3.00, 95% CI: 1.56–5.78 for > 365 days), likely reflecting the contrast with patients who received only brief periods of home care immediately before death. Conversely, younger age was associated with increased emergency visit frequency, with patients under 80 years or older having approximately twice the visit rate of those aged 90 years or older (RR 2.04, 95% CI: 1.19–3.47). This age-related pattern might reflect older patients' greater acceptance of end-of-life symptoms, better understanding of their disease trajectory, and more realistic expectations about their care needs. Additionally, older patients may have developed better coping strategies for managing minor physical discomfort through their longer experience with chronic conditions. Age-specific care approaches should be considered, as younger patients and their caregivers may require additional support in understanding end-of-life trajectories. In this study, the presence or absence of care level did not significantly influence outcomes. Previous research has demonstrated that higher care level dependency and medical interventions (such as urinary catheters and central venous ports) typically correlate with increased emergency home visits.<sup>[21]</sup> Another literature also identified higher care level and cancer as predictor of

**Table 2**

**Characteristics of emergency visits in the last 30 days before death (N = 86 visits).**

	Number (%) (N = 86)
Primary reason for visit	
Gastrointestinal symptoms	18 (20.9)
Neurological symptoms*	12 (14.0)
Respiratory distress	11 (12.8)
Clinical assessment†	11 (12.8)
Pain	10 (11.6)
Feeding difficulties	9 (10.5)
Fever	7 (8.1)
Other symptoms	8 (9.3)
Visit requested by	
Visiting nurse	40 (46.5)
Family caregiver	36 (41.9)
Facility staff‡	5 (5.8)
Patient	3 (3.5)
Clinic-initiated§	2 (2.3)
Time of day	
Afternoon (12:00–17:59)	32 (37.2)
Morning (06:00–11:59)	25 (29.1)
Evening (18:00–23:59)	25 (29.1)
Early morning (00:00–05:59)	4 (4.7)
Day of the week	
Saturday	17 (19.8)
Sunday	17 (19.8)
Monday	15 (17.4)
Friday	13 (15.1)
Tuesday	11 (12.8)
Wednesday	8 (9.3)
Thursday	5 (5.8)
Medical interventions	
Clinical observation only	23 (26.7)
Laboratory tests	19 (22.1)
Medication prescription	18 (20.9)
Injectable medications	14 (16.3)
Intravenous therapy	6 (7.0)
Other interventions	31 (36.1)

\* Includes altered consciousness or paralysis.

† Clinical assessment visits involved evaluation and care planning without specific medical interventions.

‡ Professional caregivers at residential facilities.

§ Proactive visits based on clinic's assessment of patient needs.

|| Multiple interventions were possible during a single visit, with the denominator set as the total number of visits (N = 86).

**Table 3**

**Medical interventions provided during emergency visits by primary reason for visit (N = 86 visits).**

Primary reasons for visit*	Total	Medication prescription	Injectable Medications	Laboratory sampling	IV therapy	Others	Observation
Respiratory distress	18	7 (38.9)	7 (38.9)	3 (16.7)	2 (11.1)	1 (0.1)	6 (33.3)
Fever	11	3 (27.3)	3 (27.3)	5 (45.5)	2 (18.2)	1 (0.1)	2 (18.2)
Disturbance of consciousness or paralysis	11	1 (0.1)	1 (0.1)	1 (0.1)	2 (18.2)	0 (0.0)	8 (72.7)
Pain	7	4 (57.1)	2 (28.6)	2 (28.6)	0 (0.0)	0 (0.0)	1 (14.3)
Digestive symptoms	9	3 (33.3)	1 (11.1)	2 (22.2)	2 (22.2)	3 (33.3)	1 (11.1)
Inability of water and food intake	10	2 (20.0)	1 (1.0)	3 (30.0)	6 (60.0)	0 (0)	1 (1.0)
Evaluation or consultation	12	1 (8.3)	1 (8.3)	1 (8.3)	0 (0.0)	0 (0.0)	9 (75.0)
Others**	8	2 (25.0)	3 (37.5)	1 (12.5)	0 (0.0)	1 (12.5)	3 (37.5)

\* A single emergency visit may involve multiple chief complaints and interventions. These are not mutually exclusive.

\*\* Others include Difficulty moving, Intravenous line dislodgement, Loose cast, and Unknown.

**Table 4**

**Factors associated with number of emergency visits in last 30 days: results from unadjusted and adjusted poisson regression models.**

	Unadjusted RR (95% CI)	Adjusted RR (95% CI)	$\beta$ (P value)
Sex			
Male	1.00		
Female	1.05 (0.65–1.69)		
Age (years)			
≥90	1.00	1.00	–
<79	1.66 (0.91–3.01)	2.04 (1.19–3.47)**	0.71 (<.01)
80–89	1.15 (0.67–1.98)	1.16 (0.71–1.92)	0.15 (.55)
Care level			
certification			
Not certified	1.00		
Certified	0.82 (0.45–1.50)		
Living			
arrangement			
Other†	1.00		
With family	1.14 (0.60–2.15)		
Primary disease			
Non-cancer	1.00		
Cancer	0.72 (0.44–1.16)		
Duration of home care			
≤30 days	1.00	1.00	–
31–365 days	2.25 (1.13–4.49)*	2.30 (1.16–4.54)*	0.83 (.02)
>365 days	2.4 (1.28–4.50)**	3.00 (1.56–5.78)**	1.10 (<.01)
Month of death			
Spring	1.00		
Summer	3.02 (1.35–6.75)**		
Autumn	2.22 (1.04–4.76)*		
Winter	2.37 (1.04–5.41)*		

RR = relative risk, CI = confidence interval,  $\beta$  = Regression coefficient; Only variables significant in the final model ( $P < .05$ ) are shown. Initial model included sex, care level certification, living arrangement, and primary diseases; Deviance Goodness-of-Fit = 89.1 ( $P = .18$ ), McFadden  $R^2 = 0.077$ .

\* $P < .01$ .

\*\* $P < .001$ .

† Includes those living alone or in residential facilities.

frequent emergency visits.<sup>[22]</sup> A major difference between the previous studies and the present study is that the latter focused exclusively on the period before end-of-life care. In general, a higher care level is associated with a greater need for emergency visits. However, when limited to the terminal phase, this factor appears to have a less significant impact. One possible reason is that, even if an individual has a lower certified level of care dependency, their condition may deteriorate rapidly in the terminal stage, leading to the emergence of various symptoms.

## 5. Strengths

This study is the first to analyze home visits just before end-of-life care in the setting of home medical care in Japan. A notable feature of this study is that it focuses on cases that resulted in emergency home visits, rather than analyzing all reported complaints. Furthermore, although the sample size may have been relatively small, which could increase the risk of overfitting and model instability, a previous study indicated that a ratio of 12.5 to 1 represents the lower bound of the recommended ratio of sample size to the number of independent variables,<sup>[23]</sup> highlighting the potential limitation related to our sample size. Nevertheless, Poisson regression analysis, used to examine factors influencing home visits, showed no evidence of overfitting, indicating that the model was appropriately specified.

## 6. Limitations

While this study provides helpful insights for home care patients, some limitations should be acknowledged. First, the retrospective nature of the study means that we could not capture real-time decision-making processes that led to emergency visits, which might have provided valuable insights into preventable visits. Second, the information on care levels recorded in the medical records was the latest available data but may not accurately represent the care level at the time of death. However, as this information is typically updated during application, it is likely to reflect the care level shortly before death. Due to the time gap between the application for a change in care level and its approval, the care level may be assessed lower than the actual level in the terminal phase. This may result in an underestimation of the impact of care level on home visits. Third, reasons for emergency visits might be inaccurate because nonmedical staff at the clinic receive phone calls. These staff are trained to triage patients' symptoms over the phone and refer cases to physicians who decide whether an emergency visit is necessary. However, there may be potential bias from the staff member who receives the phone call and records the reason for the visit (e.g., interpretation or reporting bias), particularly in cases involving patients with multiple problems. This bias may have led to an overestimation of emergency home visits that resulted in observation only.

## 7. Conclusions

Emergency home visits in the terminal phase often clustered near death and were influenced not only by clinical symptoms but also by psychosocial factors, resulting in observation only. This suggests that caregiver anxiety, rather than medical urgency, may drive some visits. While previous studies identified care level as a key predictor, our findings indicate its limited role during the terminal phase. These results highlight the need for proactive symptom management, caregiver support, and scalable interventions such as telehealth to reduce unnecessary visits and ensure appropriate end-of-life care.

## 8. Future recommendations

Future study should aim for larger sample size to enhance the reliability and external validity of the results. In the future, further investigations into emergency visits and telephone consultations would be valuable, as Japanese home care is primarily composed of visits by home care physicians and visiting nurses. Additional efforts could help provide a understanding of the concerns and needs of patients and their families in home care settings.

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