

Characteristics and Outcomes of a Telehealth Home Visit Program: A Descriptive Study

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Abstract

Background: Following the COVID-19 pandemic, telehealth home visit services were increasingly adopted, but evidence on their characteristics and outcomes remains limited.

Objectives: To describe the characteristics and outcomes of patients receiving telehealth home visit services at the Department of Family Medicine, Ramathibodi Hospital.

Methods: This retrospective cohort study included 135 patients receiving telehealth home visits from 1 January 2020 to 31 December 2022, using data obtained from electronic medical records (EMR). Demographics, comorbidities, and service characteristics were collected. Outcomes included first emergency department (ED) visit and all-cause mortality within one year after the index telehealth home visit. Descriptive statistics and Cox proportional hazards regression analyses were performed.

Results: A total of 135 patients were included, with the majority being female (68.89%) and aged ≥ 81 years (45.93%). Within one year, 20 patients (14.81%) visited the ED, and 17 (12.59%) died. In the multivariable analysis, male sex (adjusted hazard ratio [HR], 3.56; 95% CI, 1.42-8.89), age ≤ 60 years (adjusted HR, 5.90; 95% CI, 1.65-21.12), and absence of caregiver engagement during telehealth home visits (adjusted HR, 3.68; 95% CI, 1.31-10.34) were independently associated with a higher ED visit risk.

Conclusions: Male sex, age ≤ 60 years, and the absence of caregiver participation were associated with higher ED utilization. These findings may inform patient selection, caregiver engagement, and the role of telehealth in hybrid care models for patients with ongoing care needs.

Keywords: Telehealth home visit, Telemedicine, Continuity of care

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Introduction

COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in Wuhan, China, in December 2019.¹ In Thailand, nationwide public health measures, including lockdowns introduced in April 2020, substantially affected healthcare delivery and access to medical services. These measures were gradually relaxed and officially lifted in July 2022.²⁻⁴

Before the COVID-19 pandemic, the Department of Family Medicine provided patient-centered home visit services, promoting comprehensive care and fostering long-term doctor-patient relationships.⁵ During the COVID-19 pandemic, the Royal College of Family Physicians of Thailand issued guidelines recommending the necessity of face-to-face home visits and considering alternative approaches, such as telephone or video consultations, particularly for patients with nonurgent conditions.¹ Telehealth is defined as the delivery of healthcare services through telecommunications and digital technologies

using various communication modalities.⁶ Consequently, telehealth home visits were implemented to ensure continuity of care for patients during the pandemic. Beyond the pandemic context, telehealth home visits may support access to care for patients with barriers to in-person visits, particularly older adults and those with complex healthcare needs.

Although telehealth has been widely adopted in Thailand since the COVID-19 pandemic, prior studies have yielded mixed results. While some reports suggest that telehealth can reduce emergency department (ED) visits,^{7, 8} others demonstrate the opposite.⁹ Consequently, empirical evidence regarding the characteristics of patients receiving telehealth home visit services, as well as their healthcare utilization and clinical outcomes in routine practice, remains limited. Key implementation aspects thus continue to be critical policy questions that require further investigation.

Therefore, this study aimed to describe the characteristics of patients receiving telehealth home visit services and their healthcare utilization and clinical outcomes, as measured by the incidence of ED visits and mortality. The findings may provide evidence to support the future development and optimization of telehealth home visit services for appropriate patient populations.

Methods

Study Design, Setting, and Participants

This retrospective cohort study was conducted using historical data from the Department of Family Medicine at Ramathibodi Hospital, a tertiary-care university hospital in Bangkok, Thailand. Eligible patients who received telehealth home visit services between 1 January 2020 and 31 December 2022, were identified, and their clinical outcomes were followed up for up to one year after the index telehealth home visit.

Patients of any age or sex who received an initial telehealth home visit provided by the Department of Family Medicine during the study period were eligible for inclusion. Patients with completely unavailable telehealth home visit records were excluded. A total of 179 potentially eligible records were identified from the institutional database. All eligible patients during the study period were included. Duplicate administrative records representing subsequent telehealth home visits ($n = 36$) were excluded, retaining only the index telehealth home visit for each patient. Patients with completely unavailable medical records ($n = 8$) were also excluded, resulting in a final analytical cohort of 135 patients.

Telehealth Home Visit Procedure

The telehealth home visit service comprised 3 phases, including pretelehealth, telehealth consultation, and posttelehealth follow-up. Before the consultation, patients were contacted by telephone to confirm their appointment, and each case was reviewed by the physician and multidisciplinary team to develop an individualized care plan. Telehealth consultations were conducted by telephone with the patient or an appropriate caregiver or surrogate and lasted approximately 30-60 minutes. Follow-up plans, including further telehealth or home visits, referral, or discharge, were determined according to the patient's clinical status.

Data Collection

All study variables were retrospectively retrieved from the electronic medical record (EMR) system of Ramathibodi Hospital using a standardized data extraction form developed by the investigators. The form collected baseline demographic characteristics

(age, sex, healthcare coverage, and residential address), clinical characteristics, including comorbidities, telehealth service characteristics, and study outcomes. The primary outcomes were the first ED visit and all-cause mortality within one year after the index telehealth home visit. An ED visit was defined as any presentation to the ED of Ramathibodi Hospital during the follow-up period. All-cause mortality was defined as death from any cause documented during follow-up. Mortality data were verified through 2 sources, including in-hospital deaths, which were confirmed through official death certificates and clinical records documented in the hospital EMR system, and out-of-hospital deaths, which were identified when family members or caregivers contacted the home care team to report the patient's death. Deaths occurring outside the hospital without notification to the care team could not be captured. Study variables included age, sex, healthcare coverage, patient group, waiting time, medication-related problems, referring department, and service distance. Patient group was recorded by the treating physician in the EMR at the index telehealth home visit using one of 3 predefined categories (geriatric, chronic illness, or palliative). The investigators used the physician-recorded patient group for the analysis and did not retrospectively reclassify patients. For regression analyses, age was categorized into 3 clinically meaningful groups (≤ 60 years, 61-80 years, and ≥ 81 years). Service distance was defined as the distance between Ramathibodi Hospital and the patient's residence. According to the Department of Family Medicine policy, a residential distance within a 30-km radius was used as a general eligibility criterion for telehealth home visit services. However, exceptions were considered based on clinical needs and service feasibility. In this study, service distance was reported to characterize the geographical distribution of patients receiving telehealth home visit services.

Statistical Analysis

Descriptive statistics were presented as means (SD) for continuous variables and frequencies for categorical variables. Incidence rates were calculated per 1000 person-years. Time-to-event analyses for the first ED visit and all-cause mortality were performed using Cox proportional hazards regression to estimate hazard ratios (HRs) with 95% CIs. For the ED visit outcome, follow-up time was calculated from the index telehealth home visit to the first ED visit. Patients who did not experience an ED visit were censored at the date of death or at one year after the index visit, whichever occurred first. For the mortality outcome, follow-up time was calculated from the index telehealth home visit to death. Patients who remained alive were censored at one year after the index visit. Both univariable and multivariable Cox models were constructed. Variables with $P < .10$ in the univariable analyses, together with clinically relevant variables and important potential confounders (including age and sex), were considered for inclusion in the multivariable Cox proportional hazards regression models. Given the limited number of outcome events, the number of variables included in the multivariable models was restricted to reduce the risk of model overfitting. Candidate variables were evaluated in multivariable models, with final variable selection guided by the multivariable results together with clinical relevance and potential confounding. The final ED visit model included sex, age group, and main caregiver engagement during telehealth home visits, whereas the final mortality model included sex, age group, and patient group. Female patients and those aged ≥ 81 years served as reference groups in both models. Patients with caregiver involvement served as the reference group for the ED visit model, while the geriatric group served as the reference category for patient group in the mortality model. The proportional hazards assumption was assessed

using Schoenfeld residuals, with no violations observed. Among the included patients, missing data for individual variables were categorized as "Not Available". No imputation was performed. Statistical analyses were performed using SPSS version 18.0 (IBM Corp), with Stata version 18 (StataCorp LLC) additionally used for Cox proportional hazards regression analyses. A P value $< .05$ was considered statistically significant. To minimize potential sources of bias, all eligible patients were included, and data were extracted using a standardized data collection form. However, ED visits were ascertained from the institutional EMR and were therefore limited to presentations at Ramathibodi Hospital. Although mortality was additionally identified through reports from family members or caregivers, deaths occurring outside the hospital without notification to the care team may not have been captured. Consequently, the incidence of these outcomes may have been underestimated.

Results

Demographic Data

The majority of patients were female (68.89%). Most patients were aged ≥ 81 years or 61-80 years, accounting for 45.93% and 44.44%, respectively. The majority resided in Bangkok (71.11%), and nearly half were covered by government or state enterprise officer schemes (49.63%), followed by the universal coverage scheme (34.07%) (Table 1).

Table 1. Demographic Data of Patients

Variable	No. (%)
Sex	
Female	93 (68.89)
Male	42 (31.11)
Age, y	
≤ 60	13 (9.63)
61-80	60 (44.44)
≥ 81	62 (45.93)
Residential location of patients*	
Bangkok	96 (71.11)
Nonthaburi	19 (14.07)
Pathum Thani	9 (6.67)
Samut Prakan	8 (5.93)
Nakhon Pathom	3 (2.22)
Health insurance coverage	
Government or state enterprise officer	67 (49.63)
Universal coverage scheme	46 (34.07)
Self-pay	14 (10.37)
Social security scheme in area	6 (4.44)
Other healthcare coverage	2 (1.48)

* Patient residential location was determined based on the address recorded in the hospital's electronic medical records (EMR).

Underlying Medical Conditions

Hypertension was the most common comorbidity among patients receiving telehealth home visit services, followed by dyslipidemia, bone and joint disease, neurodegenerative disease, and diabetes mellitus (Figure 1).

Telehealth Home Visit Details

Most patients receiving telehealth home visit services were established patients (74.07%), while 25.93% were new referrals, primarily from the Family Medicine Outpatient Department (65.71%) and the Palliative Care Clinic (11.43%). When classified by patient group, geriatric patients constituted the largest proportion of the study population, at 74.81%.

Among newly referred patients, the mean waiting time for the first telehealth home visit was 59 days, and the mean (range) service distance was 19.47 (1.1-48) km. The shortest waiting time was 13 days, observed in a palliative patient, whereas the longest waiting time was 189 days in a geriatric patient whose family requested it. At the time of receiving telehealth home visit services, most patients resided in Bangkok (61.48%) and lived in private homes (78.52%). The most common origin of telehealth home visits was COVID-19-related circumstances (29.63%), followed by physician orders (10.37%). Polypharmacy (> 5 medications) was identified in 56.29% of patients, and medication-related problems were detected in 7.41% (Table 2).

Figure 1. Distribution of Underlying Medical Conditions in Patients Receiving Telehealth Home Visit Services

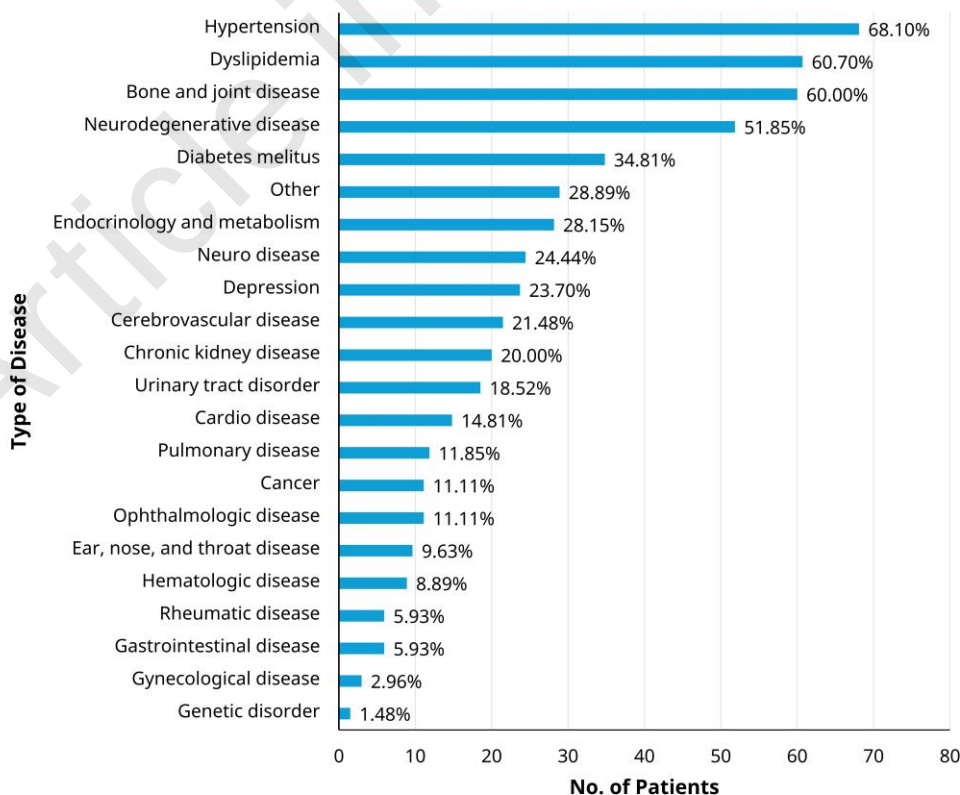


Table 2. Initial Telehealth Home Visit Characteristics

Variable	No. (%)
Patient classification	
New patients	35 (25.93)
Established patients	100 (74.07)
Patient group	
Geriatric	101 (74.81)
Chronic illness	23 (17.04)
Palliative	11 (8.15)
Referring department	
Family medicine outpatient department	23 (65.71)
Palliative care clinic	4 (11.43)
Inpatient department	3 (8.57)
Other outpatient departments	3 (8.57)
Geriatric medicine department	2 (5.71)
Patient location*	
Bangkok	83 (61.48)
Nonthaburi	16 (11.85)
Pathum Thani	8 (5.92)
Samut Prakan	6 (4.45)
Nakhon Pathom	1 (0.74)
No data	21 (15.56)
Residence type	
Private home	106 (78.52)
Nursing home	11 (8.15)
No data	18 (13.33)
Origin of telehealth home visit	
COVID-19 circumstances	40 (29.63)
Physician order	14 (10.37)
Patient/family request	5 (3.70)
Nursing home visitation policy	5 (3.70)
Excessive distance for traditional home visit	1 (0.74)
No data	70 (51.85)
Medication-related problems	10 (7.41)
No. of medications	
≤ 5	50 (37.04)
> 5	76 (56.29)
No data	9 (6.67)

* Patient residential location was determined based on the patient's actual place of residence obtained through history-taking during the initial telehealth home visit.

The most common care plans during telehealth visits were follow-up, caregiver and family assessment, and fall assessment (Figure 2). By patient group, geriatric patients and patients with chronic illness most frequently required disease management and caregiver and family assessment, while palliative patients primarily received symptom management.

Among palliative patients, no telehealth visits were conducted for family meetings or bereavement and grief. During telehealth home visits, main caregivers, particularly daughters, were the most frequently involved individuals, followed by patients themselves. Most encounters included 1-3 individuals (Tables 3 and 4).

Figure 2. Distribution of Patient and Family Care Plans in Telehealth Home Visit Services

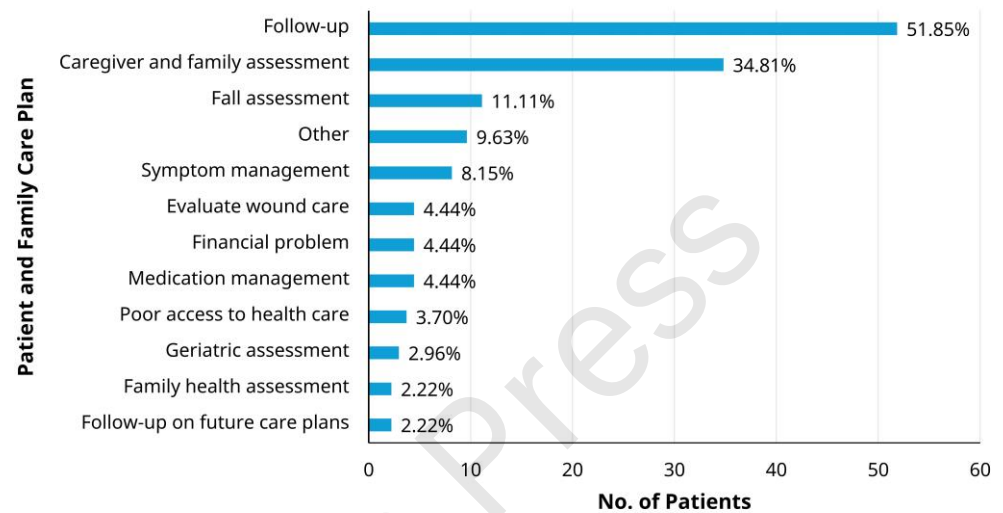


Table 3. Distribution of Home Interventions for Telehealth Home Visit Services

Indication for Telehealth	No. (%) [*]		
	Geriatric Patients (n = 101)	Chronic Illness Patients (n = 23)	Palliative Patients (n = 11)
Initial assessment	24 (17.77)	8 (5.93)	5 (3.70)
Caregiver and family assessment	78 (57.78)	19 (14.07)	8 (5.93)
Family meeting	8 (5.93)	1 (0.74)	0
Hospitalization follow-up home visit	4 (2.96)	3 (2.22)	6 (4.44)
Disease management	82 (60.74)	19 (14.07)	0
Medication management	26 (19.26)	10 (7.41)	0
Fall assessment	16 (11.85)	0	0
Symptom management	0	0	10 (7.41)
Preparation for home death	0	0	1 (0.74)
Bereavement and grief	0	0	0

^{*}The total count may exceed the total number of patients due to multiple responses.

Table 4. Persons Engaged by the Medical Team in Telehealth Home Visit Services

Variable	No. (%)
All	135 (100.00)
Patient	36 (26.67)
Nursing home staff	8 (5.93)
Paid caregiver	4 (2.96)
Main caregiver	78 (57.78)
Daughter	31 (39.74)
Son	14 (17.95)
Wife	7 (8.97)
Grandchild	7 (8.97)
Sibling	6 (7.69)
In-law relatives	6 (7.69)
Husband	5 (6.41)
Mother	2 (2.56)
Other people	9 (6.67)

After receiving telehealth home visit services, 20 patients (14.81%) presented to the ED, most commonly due to urinary tract infections, respiratory tract infections, and gastrointestinal bleeding. Of these, 30.00% required hospitalization, with a length of stay ranging from 1 to 17 days. In addition, 17 patients (12.59%) died following the telehealth home visit intervention, with most deaths occurring among geriatric patients. Furthermore, 76.29% of patients continued to receive follow-up home visits, with a mean (range) interval of 110 (8-205) days between visits (Table 5).

In the univariable Cox proportional hazards analysis, male sex, age ≤ 60 years, palliative and chronic illness groups, and the absence of main caregiver engagement during telehealth home visits were significantly associated with an increased risk of ED presentation within one year. In the multivariable model, which included sex, age group, and main caregiver engagement, male sex (adjusted HR, 3.56; 95% CI, 1.42-8.89; $P = .007$), age ≤ 60 years (adjusted HR, 5.90; 95% CI, 1.65-21.12; $P = .006$), and the absence of main caregiver engagement (adjusted HR, 3.68; 95% CI, 1.31-10.34; $P = .013$) remained significantly associated with an increased risk of ED presentation within one year (Table 6).

In the univariable Cox proportional hazards analysis, the palliative group had a significantly higher risk of one-year mortality compared with the geriatric group (HR, 6.04; 95% CI, 2.02-18.08; $P = .001$). Patients aged ≤ 60 years had a higher estimated risk of mortality than those aged ≥ 81 years, although the association was not statistically significant (HR, 2.88; 95% CI, 0.84-9.83; $P = .092$). Other variables, including male sex, age 61-80 years, underlying cancer, neurodegenerative disease, and nursing home staff engagement during telehealth home visits, were not significantly associated with mortality. In the multivariable Cox proportional hazards model including sex, age group, and patient group, the palliative group remained at a significantly higher risk of mortality compared with the geriatric group (adjusted HR, 4.64; 95% CI, 1.37-15.73; $P = .014$). No significant associations were observed for sex, age group, or the chronic illness group in the adjusted model (Table 7).

Table 5. Outcomes Following Initial Telehealth Home Visit

Variable	No. (%) [*]
Emergency department presentation following telehealth home visit services	20 (14.81)
Geriatric	10 (50.00)
Chronic illness	6 (30.00)
Palliative	4 (20.00)
Mortality following telehealth home visit services	17 (12.59)
Geriatric	9 (52.94)
Chronic illness	3 (17.65)
Palliative	5 (29.41)
Patients receiving continued home visits	103 (76.29)

^{*} Outcomes were assessed separately; individual patients could be included in more than one outcome category.

Table 6. One-Year Emergency Department Presentation Incidence Rates Following Telehealth Home Visit Services

Variable	Univariable HR (95% CI)	P Value	Multivariable HR (95% CI)	P Value
Sex, male vs female	3.69 (1.51-9.03)	.004	3.56 (1.42-8.89)	.007
Age, y				
≥ 81	1 [Reference]	NA	1 [Reference]	NA
≤ 60	8.76 (2.47-31.12)	.001	5.90 (1.65-21.12)	.006
61-80	2.79 (0.87-8.89)	.083	2.35 (0.72-7.65)	.157
Patient group				
Geriatric	1 [Reference]	NA	NA	NA
Palliative	4.24 (1.33-13.54)	.015	NA	NA
Chronic illness	2.98 (1.08-8.21)	.034	NA	NA
Medication-related problems, yes vs no	2.84 (0.83-9.70)	.096	NA	NA
Cancer				
No	1 [Reference]	NA	NA	NA
Yes	1.48 (0.43-5.05)	.532	NA	NA
Patient engagement during telehealth home visit				
Yes	1 [Reference]	NA	NA	NA
No	1.13 (0.41-3.10)	.818	NA	NA
Main caregiver engagement during telehealth home visit				
Yes	1 [Reference]	NA	1 [Reference]	NA
No	4.09 (1.49-11.26)	.006	3.68 (1.31-10.34)	.013

Abbreviations: HR, hazard ratio; NA, not applicable.

Table 7. One-Year Mortality Incidence Rates Following Telehealth Home Visit Services

Variable	Univariable HR (95% CI)	P Value	Multivariable HR (95% CI)	P Value
Sex, male vs female	1.65 (0.63-4.33)	.311	1.26 (0.46-3.44)	.646
Age, y				
≥ 81	1 [Reference]	NA	1 [Reference]	NA
≤ 60	2.88 (0.84-9.83)	.092	1.83 (0.44-7.55)	.402
61-80	0.88 (0.29-2.61)	.814	0.93 (0.31-2.81)	.897
Patient group				
Geriatric	1 [Reference]	NA	1 [Reference]	NA
Palliative	6.04 (2.02-18.08)	.001	4.64 (1.37-15.73)	.014
Chronic illness	1.5 (0.41-5.54)	.543	1.13 (0.26-4.88)	.871
Cancer				
No	1 [Reference]	NA	NA	NA
Yes	1.77 (0.51-6.15)	.371	NA	NA
Neurodegenerative disease				
No	1 [Reference]	NA	NA	NA
Yes	1.40 (0.54-3.64)	.486	NA	NA
Nursing home staff engagement during telehealth home visit				
No	1 [Reference]	NA	NA	NA
Yes	1.06 (0.14-8.00)	.954	NA	NA

Abbreviations: HR, hazard ratio; NA, not applicable.

Discussion

In this study, most patients receiving telehealth home visits were older adults with noncommunicable diseases, consistent with the eligibility criteria of the Home Care Program at the Department of Family Medicine at Ramathibodi Hospital, which primarily serves older adults, patients with chronic illnesses, patients receiving palliative care, individuals with mobility or transportation limitations, and those requiring post-discharge follow-up. This patient profile is also consistent with the broader trend toward population aging.^{10, 11} The program is designed to enhance patients' and caregivers' confidence in home-based care, support self-management, and facilitate proactive identification of health risks within the home environment through a family-oriented care approach.¹⁰

Previous studies have shown that homebound individuals are predominantly older adults with mobility limitations who experience difficulty accessing healthcare services and are at increased risk of hospitalization, suggesting that telehealth home visits may be a practical approach to supporting healthcare access in this population.¹² In addition, multimorbidity and polypharmacy are common among patients receiving home-based care and substantially increase the complexity of clinical management, highlighting the need for ongoing monitoring and regular medication review.¹³ This study likewise demonstrated a high prevalence of polypharmacy, which has been associated with poor medication adherence, medication errors, drug-drug interactions, and reduced quality of life among homebound patients.¹⁴ Collectively, these findings indicate that, in this study setting, telehealth home visits were predominantly delivered to patients with complex healthcare needs rather than to the general older adult population.

It should also be noted that the Home Care Program generally serves patients residing within a 30-km radius of the hospital, although exceptions may be made on a case-by-case basis. Consequently, these study findings may not be generalizable to patients living in remote or rural areas, who may derive different or even greater benefits from telehealth home visits.

Following telehealth home visits, 14.8% of patients visited the ED, most commonly due to urinary tract infections, respiratory tract infections, and gastrointestinal bleeding. These conditions are common acute illnesses among frail older adults with multiple chronic conditions. Therefore, the observed ED utilization is more likely to reflect the high baseline risk of the study population than the failure of the telehealth home visit service itself. Previous studies have shown that homebound individuals commonly have functional dependence, multiple comorbidities, and greater healthcare utilization, including higher rates of ED visits and hospitalizations than non-homebound older adults.^{15, 16} Accordingly, ED visits following telehealth home visits should be interpreted within the context of the patients' underlying disease burden rather than as a direct measure of service effectiveness, as this descriptive study was not designed to determine the effect of telehealth home visits on ED utilization.

In the analysis of factors associated with ED visits, male sex was independently associated with a higher risk of ED utilization. This finding is consistent with previous studies suggesting that men may be less likely to seek healthcare and may delay medical consultation after symptom onset, potentially contributing to more advanced disease at presentation.^{17, 18} However, whether this mechanism also applies to patients receiving telehealth home visits requires further investigation.

Patients aged ≤ 60 years also had a higher risk of ED visits than those aged ≥ 81 years. Although this finding appears counterintuitive, it may reflect the selection criteria of the Home Care Program. Younger patients eligible for home visits often have severe disabilities, neurological disorders, or significant functional impairment requiring home-based care, which may indicate greater disease complexity than that of some older adults with relatively stable conditions.¹⁹ These findings suggest that disease severity and functional dependency may be more important determinants of ED utilization than chronological age alone. These findings should be confirmed in larger studies.

Another notable finding was that the absence of caregiver participation during telehealth home visits was independently associated with an increased risk of ED utilization. Caregivers play a central role in home-based care by facilitating communication between patients and healthcare professionals,²⁰ monitoring symptoms, recognizing clinical deterioration, reporting concerning changes, and supporting timely decisions to seek medical evaluation.^{21, 22} In the context of telehealth, caregivers may also assist with technology use, provide essential clinical information, and promote adherence to care plans, thereby improving the continuity and safety of home-based care.²³ These roles may explain the increased risk of ED visits among patients without caregiver participation observed in the present study.

The multivariable analysis further demonstrated that male sex, age ≤ 60 years, and the absence of caregiver participation were independently associated with ED utilization. Taken together, these findings suggest that the risk of ED visits may be influenced by factors beyond chronological age alone, including patient characteristics and the availability of caregiver support within the home care setting.

During follow-up, 12.6% of patients died, with the highest mortality observed among patients receiving palliative care. In the Cox proportional hazards analysis, the palliative

group was significantly associated with a higher risk of one-year mortality compared with the geriatric group, and this association remained statistically significant after adjustment for sex and age group (adjusted HR, 4.64; 95% CI, 1.37-15.73; $P = .014$). This finding is consistent with the clinical characteristics of the palliative care population, who generally have advanced illnesses, greater frailty, and a higher risk of mortality. Therefore, the observed association is more likely to reflect the natural course and severity of underlying illnesses rather than an effect of the telehealth home visit model itself. Given the small number of mortality events and the wide 95% CI, the adjusted estimate should be interpreted cautiously.

Although this study was not designed to determine whether telehealth home visits reduce mortality, previous systematic reviews have suggested that telehealth may support symptom monitoring, improve continuity of care, facilitate caregiver involvement, and enable timely responses to clinical deterioration, particularly among patients receiving home-based palliative care.^{24, 25} However, evidence demonstrating a direct effect of telehealth on mortality remains limited, and further studies are required to clarify its impact on survival outcomes. The findings of this study may help identify patients who require closer follow-up and support the refinement of patient selection and telehealth service delivery within home care programs.

Although telehealth home visits were initially implemented in response to the COVID-19 pandemic, accumulating evidence suggests that their role may extend beyond the pandemic period.^{26, 27} Telehealth may continue to serve as a complementary approach for selected populations, including homebound individuals, patients with mobility limitations, and those requiring continuous monitoring or follow-up care.^{12, 27} Rather than replacing conventional home visits, telehealth is likely to be most beneficial when integrated into a hybrid care model combining remote monitoring with face-to-face assessments according to individual patient needs.²⁶

The present findings suggest that careful patient selection and caregiver engagement may be important considerations when implementing telehealth home visit services. Patients with characteristics associated with a higher risk of ED utilization may warrant closer follow-up and greater caregiver involvement. These real-world findings may assist healthcare providers in refining patient selection, caregiver engagement, and follow-up strategies and may also inform future service planning and the design of prospective comparative studies.

This study has several limitations. As a retrospective, single-center study conducted at a tertiary care hospital, the findings may not be generalizable to other healthcare settings with different patient populations and service models. Furthermore, outcome ascertainment may have been incomplete because ED visits to other hospitals were not captured, and out-of-hospital deaths may have been underestimated in the absence of linkage to a national registry database. In addition, the use of routinely collected EMR data may have resulted in missing or unavailable variables, including standardized measures of disease severity, which precluded adjustment for some important potential confounders and may have affected the interpretation of the findings. Selection bias is also possible because patients were referred for telehealth home visit services based on clinical indications and predefined service eligibility criteria rather than through random selection. Consequently, the study population may represent a subgroup with greater healthcare needs, functional limitations, or higher disease complexity than the general population, which may limit the generalizability of the findings to other patients who could potentially benefit from telehealth services. Moreover, the absence of a comparator group precludes

causal inference regarding the effectiveness of telehealth home visit services. Finally, the relatively small number of outcome events, particularly mortality events, may have reduced the precision of multivariable estimates and increased the risk of model overfitting. Therefore, these findings should be interpreted with caution and confirmed in larger prospective studies.

Conclusions

This study provides a real-world description of patients receiving telehealth home visit services in a tertiary care Home Care Program. Male sex, age ≤ 60 years, and the absence of caregiver participation were associated with higher ED utilization. These findings may inform patient selection, caregiver engagement, and the role of telehealth as part of hybrid care models for patients with ongoing care needs.

Additional Information

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Ethics Approval: This study was approved by the Human Research Ethics Committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University (MURA2023/806 on 14 October 2023).

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