

Hospital-at-Home in Taiwan: Reducing Hospital Stay and Medical Expenditures

Tian-Hoe Tan^{1,2}, Yu-Chieh Ho¹, Hung-Lin Hsu¹, Ting-Chia Chang³⁻⁵, Kang-Ting Tsai^{6,7}, Hung-Jen Tang⁸, Chien-Chin Hsu^{1,4}, Hung-Jung Lin^{1,4,9}, Hsiu-Chin Chen^{7,10*}, Chien-Cheng Huang^{1,4,11,*}

¹Department of Emergency Medicine, Chi Mei Medical Center, Tainan, Taiwan; ²School of Medicine, Chung Shan Medical University, Taichung, Taiwan; ³Division of Chest Medicine, Department of Internal Medicine, Chi Mei Medical Center, Tainan, Taiwan; ⁴School of Medicine, College of Medicine, National Sun Yat-Sen University, Kaohsiung, Taiwan; ⁵Department of Environmental and Occupational Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan; ⁶Department of Family Medicine, Chi Mei Medical Center, Tainan, Taiwan; ⁷Department of Senior Services, Southern Taiwan University of Science and Technology, Tainan, Taiwan; ⁸Department of Internal Medicine, Chi Mei Medical Center, Tainan, Taiwan; ⁹Department of Emergency Medicine, Taipei Medical University, Taipei, Taiwan; ¹⁰Department of Nursing, Chi Mei Medical Center, Tainan, Taiwan; ¹¹Department of Emergency Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

*These authors contributed equally to this work

Correspondence: Chien-Cheng Huang, Department of Emergency Medicine, Chi Mei Medical Center, 901 Zhonghua Road, Yongkang District, Tainan, 710, Taiwan, Tel +886-6-281-2811, Fax +886-6-281-6161, Email chienchenghuang@yahoo.com.tw; Hsiu-Chin Chen, Department of Nursing, Chi Mei Medical Center, 901 Zhonghua Road, Yongkang District, Tainan, 710, Taiwan, Tel +886-6-281-2811, Fax +886-6-281-6161, Email 300006@mail.chimei.org.tw

Background: Hospital-at-Home (HaH) is an alternative care model that delivers hospital-level treatment at home, improving patient outcomes while reducing healthcare costs. Despite its success globally, HaH was not implemented in Taiwan until the initiation of a pilot program. This study evaluates the outcomes of HaH compared to traditional hospitalization.

Methods: A retrospective cohort study was conducted at a tertiary medical center in Taiwan. HaH patients diagnosed with pneumonia, urinary tract infection, or soft tissue infection between August 1, 2024, and January 31, 2025, were included (n = 69). A matched hospitalized cohort (n = 246) was selected based on age, sex, and diagnosis. Outcomes, including length of stay, medical expenditure, emergency department (ED) visits, rehospitalization, and patient satisfaction, were analyzed using univariate and logistic regression analyses.

Results: The HaH cohort had a significantly shorter length of stay (adjusted OR: 0.53, 95% CI: 0.30–0.93, p = 0.028) and lower medical expenditure (adjusted OR: 0.18, 95% CI: 0.10–0.33, p < 0.001). HaH patients were more likely to transition to home healthcare (73.9% vs 7.3%, p < 0.001), and satisfaction was 100%. No significant differences were found in ED visits or rehospitalization rates between the two cohorts (all p > 0.05).

Conclusion: HaH is an effective alternative to hospitalization, reducing length of stay and medical expenses while maintaining patient safety and satisfaction. Expanding HaH to additional conditions could further enhance healthcare efficiency. These findings highlight HaH's feasibility in Taiwan and its role in healthcare resilience.

Plain Language Summary: This study examined whether patients in Taiwan could safely receive hospital-level treatment at home instead of being admitted to the hospital. This approach is called “Hospital-at-Home” (HaH). It was recently launched in Taiwan as a pilot program supported by the government’s National Health Insurance.

The researchers compared two groups of patients with infections such as pneumonia, urinary tract infections, or soft tissue infections. One group received care through the HaH model, while the other was treated in the hospital. The two groups were similar in age, sex, and diagnosis.

The results showed that HaH patients spent less time under care (an average of 7.5 days compared to 10.9 days in hospital) and their medical costs were much lower. Patient satisfaction was very high, and HaH patients were no more likely than hospitalized patients to return to the emergency room or require rehospitalization.

This study is the first of its kind in Taiwan and shows that HaH is a safe and effective alternative to traditional hospitalization. It could help reduce hospital overcrowding and support older patients and their caregivers by allowing recovery at home. The researchers suggest that HaH could also be applied to other conditions, such as heart failure or chemotherapy. With Taiwan’s aging population and strained hospital system, HaH has the potential to improve the way care is delivered.

Keywords: hospital-at-home, inpatient care, emergency department, Taiwan, healthcare cost reduction, patient satisfaction

Introduction

The aging population presents significant challenges to global healthcare systems. Between 2015 and 2050, the proportion of the world's population aged over 60 years will nearly double from 12% to 22%.¹ The number of people aged 80 years or older is expected to triple from 2020 to 2050, reaching 426 million.¹ In Taiwan, the older population (≥ 65 years) exceed 20% by 2025, becoming a "super-aged society", and is projected to surpass 24.2% by 2030 and reach 46.5% by 2060.² By 2025, approximately 12.7% of the older population have disabilities and require caregivers.² Conversely, the low birth rate has contributed to a decline in the working-age population and fewer available family caregivers.² In 2014, the old-age population dependency ratio was 6.3, and it is expected to dramatically decrease to 1.29 by 2060.² Caring for older individuals with chronic conditions, transporting disabled elderly to hospitals, or supporting hospitalized older family members places a heavy burden on the younger population.³

The increasing prevalence of disability among the elderly population presents significant challenges to healthcare systems worldwide.^{4,5} Traditional hospital settings, while essential for acute care, may not always be the most suitable environment for older adults with chronic conditions and multiple comorbidities.^{4,5} The Hospital at Home (HaH) model emerges as a viable alternative, delivering hospital-level care in the comfort of patients' homes.^{4,5} This approach has demonstrated numerous benefits, including reduced hospital readmissions, decreased length of stay, and lower incidence of hospital-acquired infections.^{4,5} Moreover, HaH programs have been associated with increased patient satisfaction and cost-effectiveness, making them a promising solution for managing the complex needs of the aging population.^{4,5} However, HaH had not been implemented in Taiwan until the initiation of the National Health Insurance Home-based Acute Care Pilot Program on July 1, 2024.⁶ Therefore, the aim of this study is to clarify the outcomes of patients receiving HaH care compared to patients receiving traditional hospital care.

Materials and Methods

Study Hospital

This study was conducted at Chi Mei Medical Center (CMMC), a tertiary medical center in southern Taiwan, with 1296 beds and over 1900 home health care patients by the end of 2024. CMMC has more than 55 full-time emergency physicians and residents, serving over 100,000 emergency department (ED) patients annually.

To address the needs of an aging population, CMMC established Taiwan's first Geriatric ED in 2019, following the creation of the Chi Mei Integrated Geriatric Emergency Team in 2016.⁷ The Geriatric ED has contributed to research and innovation in geriatric care, including emergency medical services for older adults, hospice care needs and geriatric syndromes, computer-based and pharmacist-assisted medication review, and the development of a comprehensive screening tool (Emergency Geriatric Assessment). Other key initiatives include computer-assisted home health care (HHC) referrals,⁸ interdisciplinary delirium interventions,⁹ and a transitional care model for older ED patients.¹⁰

Establishment of the HaH Team and Protocols

Although HHC has been implemented in Taiwan since 1995, it primarily functions as an extension of outpatient services, bringing clinic-based care to patients' homes.^{11,12} However, due to the lack of reimbursement from the National Health Insurance, patients requiring intravenous (IV) medications, acute care, or further diagnostic evaluations must still visit the ED. To address this gap, in July 2024, the Taiwan National Health Insurance Administration (NHIA) launched a pilot program for HaH, offering reimbursement to incentivize healthcare institutions to provide hospital-level investigations and treatments in patients' homes.¹³ The primary objective of this program is to offer appropriate home-based medical care for acute patients as an alternative to hospitalization, thereby reducing unnecessary hospital admissions and optimizing medical resource utilization.¹³

At CMMC, an interdisciplinary HaH team was established to ensure comprehensive patient care. The team consists of physicians, transitional care nurses (TCNs), home care nurses, pharmacists, respiratory therapists, medical

administrators, radiologic technologists, health insurance claims officers, information technology staff, and taxi drivers to facilitate patient transport when necessary. The physician team includes specialists in emergency medicine, geriatrics, pulmonology, and infectious diseases, ensuring expertise in managing common acute conditions in the elderly.

The NHIA's HaH program provides three reimbursement models: (1) Model A: For existing HHC patients; (2) Model B: For patients in long-term care institutions; and (3) Model C: For ED patients eligible for HaH. At CMMC, we adopted Model A and Model C and established care protocols for both models (**Figure 1**): Model A (Existing HHC Patients): If an HHC patient presents with acute symptoms suspected to be pneumonia, UTI, or soft tissue infection that would typically require hospitalization, but the patient or family opts against hospitalization, the attending physician or home care nurse assesses whether they desire HaH. If they opt for HaH, the nurse refers the patient to a TCN for further evaluation. If deemed suitable, the TCN coordinates with physicians and home care nurses to arrange HaH. Otherwise, the patient is sent to the ED for further evaluation and treatment. Model C (ED Patients): If an ED patient is diagnosed with pneumonia, UTI, or soft tissue infection, but the patient or family opts against hospitalization, the patient is referred to a TCN for assessment of HaH. If eligible, the TCN coordinates with physicians and home care nurses to initiate HaH. If not suitable, the patient is either admitted to the hospital or discharged against medical advice, with a follow-up outpatient appointment arranged.

The general criteria for selecting suitable HaH patients, as evaluated by the TCN, include: (1) Proximity to the study hospital: The patient's home must be within 10 km of the hospital to ensure timely medical support; (2) Caregiver availability and ability: The patient should have a capable caregiver to assist with daily care and medical instructions; (3)

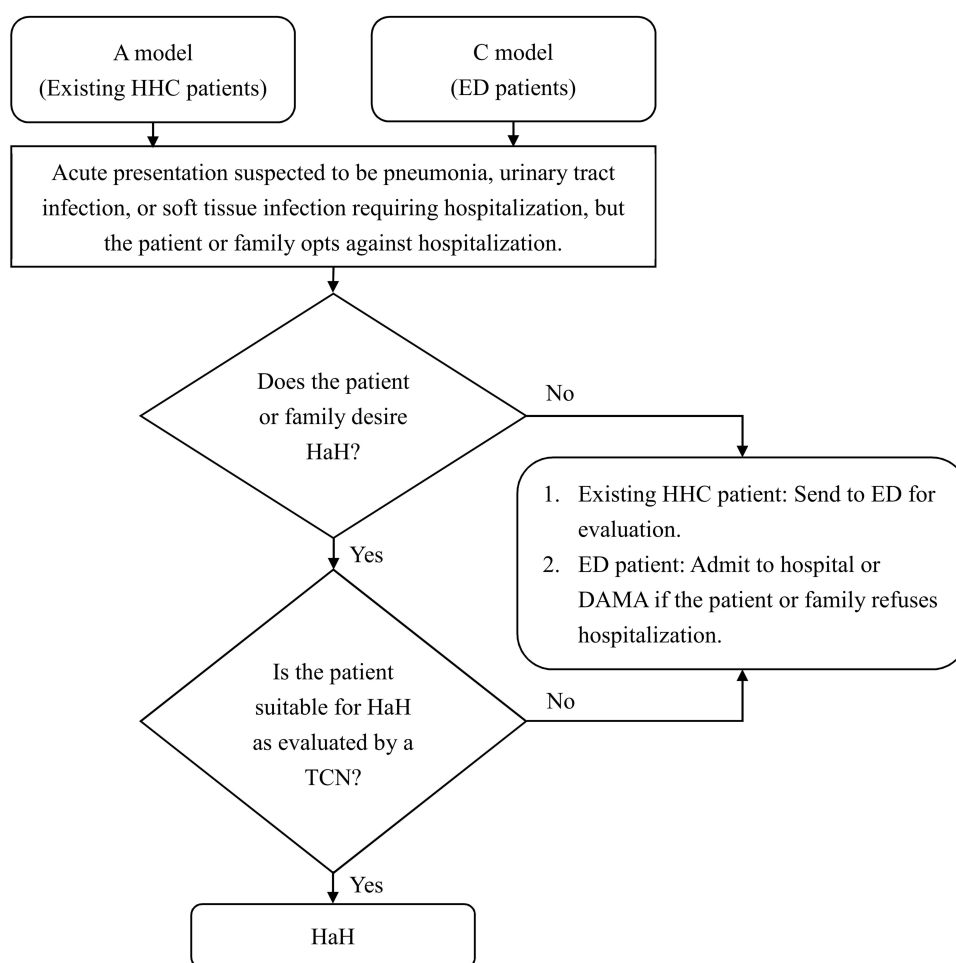


Figure 1 The A model and C model for HaH adopted in the study hospital.

Abbreviations: HHC, home health care; ED, emergency department; HaH, Hospital-at-Home; TCN, transitional care nurse; DAMA, discharge against medical advice.

Ease of peripheral IV catheter replacement: The patient's condition should allow for simple and effective IV catheter management at home; (4) Patient compliance: The patient must be cooperative and willing to follow healthcare professionals' instructions for treatment and monitoring.

To enhance patient safety and monitoring, we established a 24/7 call center for emergency response. Patients or their families can reach out for assistance at any time. Additionally, a priority pathway ("green channel") was developed for HaH patients needing urgent ED visits or hospitalization.

Furthermore, Internet of Things (IoT) technology was integrated to facilitate remote patient monitoring. During the initial stage of HaH care, families are provided with IoT-enabled vital sign monitoring devices and trained to measure and transmit patient data to the cloud. This system allows physicians and nurses to closely track the patient's condition and intervene promptly if necessary. Additionally, handheld X-ray devices were introduced, enabling home-based chest X-rays when required.

In the first and final day of HaH care, a physician must visit the patient physically to assess their condition and ensure appropriate treatment. On the remaining days, physicians may conduct virtual visits at least once per day. Meanwhile, home care nurses must visit the patient in person daily, ensuring proper care and intervention as needed.

To ensure appropriate antibiotic use, the selection of IV antibiotics in the HaH program was developed through expert consensus involving the Infectious Diseases Society of Taiwan, Taiwan Society of Emergency Medicine, Taiwan Association of Family Medicine, Taiwan Society of Home Health Care, and the Federation of Taiwan Pharmacists Associations.¹⁴ This consensus was based on current clinical practice guidelines, international experiences (eg, Australia's Hospital-in-the-Home program), and Taiwan's annual antibiotic resistance surveillance data.¹⁴ In the pilot stage, IV antibiotics with once-daily dosing (ceftriaxone, moxifloxacin, levofloxacin, and ertapenem) were prioritized to enhance feasibility in the home setting. However, to avoid overreliance on broad-spectrum once-daily agents, elastomeric infusers have now been introduced to allow continuous infusion of antibiotics requiring BID or q8h administration, though these were not yet used in the present study group. These measures were reviewed and approved by the institutional antimicrobial stewardship program and the Department of Infectious Diseases.

For patients requiring hemodialysis, the HaH pilot program allowed them to return to their usual dialysis facility for treatment.⁶ Home-based hemodialysis equipment was not included in this program.

By establishing a structured HaH team, clear care protocols, well-defined patient selection criteria, and leveraging telemedicine and IoT solutions, CMMC ensures that acute patients receive high-quality hospital-level care at home, minimizing unnecessary hospitalizations and enhancing healthcare efficiency.

Data Collection: Retrospective Cohort Study

We conducted a retrospective cohort study to analyze data from 71 HaH patients, who constituted the study cohort, between August 1, 2024, and January 31, 2025 (Figure 2). To create a comparison cohort, we identified hospitalized patients from the same period, matching them with the HaH patients at a 1:4 ratio based on age, sex, and diagnosis.¹⁵ HaH patients who were rehospitalized during their HaH course and those with insufficient data in the comparison cohort were excluded from the analysis. We collected data for both cohorts, including: demographic characteristics, underlying comorbidities, primary diagnoses, length of stay, medical expenditure, ED visits, rehospitalizations, and patient and caregiver satisfaction. We used a 5-point Likert scale to assess patient and caregiver satisfaction, defining scores of 4 and 5 as "satisfied" with HaH.

Ethical Statements

This retrospective study was approved by the Institutional Review Board of the study hospital and conducted using anonymized patient data in compliance with the ethical principles outlined in the Declaration of Helsinki. Due to the study's retrospective design and the absence of risk to patient welfare, the requirement for informed consent was waived.

Statistics

We performed a two-step analysis (Figure 2). First, we compared comorbidities, primary diagnoses, length of stay, medical expenditure, ED visits, and rehospitalizations between the HaH and comparison cohorts. Second, we analyzed

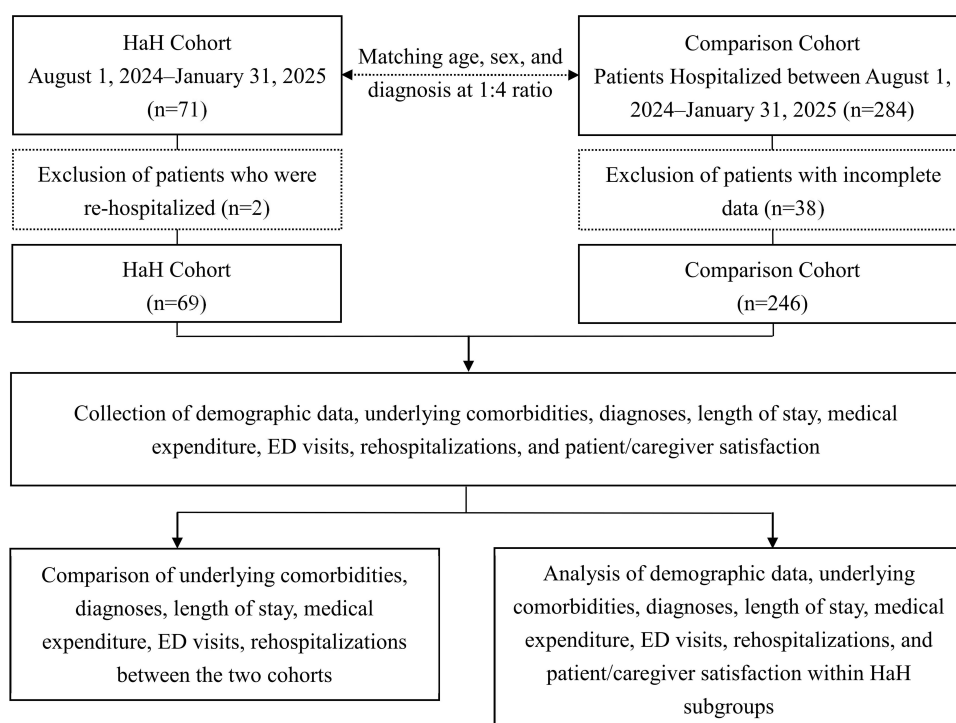


Figure 2 Flowchart of this study.

Abbreviations: HaH, Hospital-at-Home; ED, emergency department.

demographics, comorbidities, clinical outcomes, and patient/caregiver satisfaction within HaH subgroups. For univariate analysis, categorical variables were assessed using the Chi-Squared Test or Fisher's Exact Test, and continuous variables using the Mann–Whitney *U*-Test. Logistic regression analysis was conducted to compare outcomes between cohorts, adjusting for activity of daily living, cerebrovascular disease, and dementia, as these variables differed significantly in univariate analysis and were independent. Activity of daily living score was used as a proxy for baseline disease severity in the analyses. The mean HaH cohort value was used as the cutoff for analysis. All statistical analyses were performed using SAS 9.4, with a two-tailed significance level of 0.05.

Results

A total of 69 HaH patients and 246 hospitalized patients were included in the analysis (Table 1). Only two HaH patients required rehospitalization but were successfully discharged, resulting in a 97.2% HaH completion rate. The mean age

Table 1 Demographic Data, Underlying Comorbidities, and Diagnoses: Comparison Between HaH and Comparison Cohort

Variables	HaH Cohort (n=69)	Comparison Cohort (n=246)	p-value
Demographic data			
Age (years)	79.9 (9.9)	78.9 (12.7)	0.859
≤54	4 (5.8)	8 (3.3)	
55–64	3 (4.4)	11 (4.5)	
65–74	9 (13.0)	37 (15.0)	
75–84	25 (36.2)	97 (39.4)	
≥85	28 (40.6)	93 (37.8)	

(Continued)

Table 1 (Continued).

Variables	HaH Cohort (n=69)	Comparison Cohort (n=246)	p-value
Sex			0.942
Male	21 (30.4)	76 (30.9)	
Female	48 (69.6)	170 (69.1)	
Body mass index			0.934
≤18.4	32 (46.4)	108 (43.9)	
18.5–23.9	9 (13.0)	33 (13.4)	
≥24	28 (40.6)	105 (42.7)	
Iatrogenesis			
Nasogastric feeding	5 (7.3)	29 (11.8)	0.283
Foley indwelling	9 (13.0)	79 (32.1)	0.002
Tracheostomy	2 (2.9)	12 (4.9)	0.481
Activity of daily living	49.4 (35.3)	51.7 (31.4)	<0.001
Hospice and palliative care	14 (19.7)	64 (26.0)	0.330
Underlying comorbidities			
Cerebrovascular disease	21 (30.4)	43 (17.5)	0.018
Dementia	21 (30.4)	41 (16.7)	0.011
Coronary artery disease	3 (4.4)	25 (10.2)	0.134
Congestive heart failure	6 (8.7)	39 (15.9)	0.133
COPD	7 (10.1)	35 (14.2)	0.378
Diabetes	27 (39.1)	107 (43.5)	0.517
Chronic kidney disease	12 (17.4)	64 (26.0)	0.139
Malignancy	13 (18.8)	57 (23.2)	0.445
Diagnoses			0.850
Pneumonia	26 (37.7)	101 (41.1)	
UTI	32 (46.4)	105 (42.7)	
Soft tissue infection	11 (15.9)	40 (16.3)	
Mortality	1 (1.5)	16 (6.5)	0.134
Transition to HHC after discharge	51 (73.9)	18 (7.3)	<0.001

Note: Data were presented as mean (standard deviation) or n (%).

Abbreviations: HaH, Hospital at Home; COPD, chronic obstructive pulmonary disease; ED, emergency department; UTI, urinary tract infection; HHC, home health care.

was similar between the HaH and hospitalized cohorts (79.9 ± 9.9 vs 78.9 ± 12.7 years, $p = 0.859$), as was the sex distribution ($p = 0.942$). The HaH cohort had significantly lower activity of daily living (ADL) scores ($p < 0.001$), reflecting poorer functional status, and a higher prevalence of cerebrovascular disease ($p = 0.018$) and dementia ($p = 0.011$). Other comorbidities were comparable between groups (all $p > 0.05$). The most common diagnoses were UTI, pneumonia, and soft tissue infection, with no significant differences in distribution ($p = 0.850$). The mortality rate was slightly lower in HaH (1.5% vs 6.5%), though not statistically significant ($p = 0.134$). A significantly higher proportion of HaH patients transitioned to HHC after discharge (73.9% vs 7.3%, $p < 0.001$), suggesting better continuity of care.

The mean length of stay was significantly shorter in HaH patients (7.5 vs 10.9 days, $p < 0.001$), and their medical expenditure was markedly lower ($p < 0.001$) (Table 2). ED revisit and rehospitalization rates within 3 and 14 days were similar between cohorts (all $p > 0.05$). All patients and caregivers in the HaH group reported being satisfied, though no data were available for hospitalized patients.

Logistic regression analysis confirmed that HaH patients were significantly less likely to experience prolonged hospitalization (>7.5 days) (adjusted OR = 0.53, $p = 0.028$) and incurred lower medical costs ($>29,209.9$ NTD, adjusted OR = 0.18, $p < 0.001$) (Table 3). Despite lower baseline activity of daily living scores, indicating poorer functional status, HaH patients had similar safety outcomes and lower medical expenditure compared with hospitalized patients. There were no significant differences in ED revisits or rehospitalizations between groups (all $p > 0.05$).

Table 2 Univariate Analysis of Length of Stay, Medical Expenditure, ED Visits, Rehospitalizations, and Patient/Caregiver Satisfaction Between HaH and the Comparison Cohort

Outcomes	HaH Cohort	Comparison Cohort	p-value
Length of stay (day)	7.5 (1.7)	10.9 (8.9)	<0.001
Medical expenditure (NTD)	29209.9 (7839.6)	90031.4 (153854.5)	<0.001
ED visit			
< 3 days	3 (4.4)	7 (2.9)	0.461
<14 days	2 (2.9)	5 (2.0)	0.650
Rehospitalization			
< 3 days	8 (11.6)	27 (11.0)	0.885
<14 days	7 (10.1)	18 (7.3)	0.443
Patient/caregiver satisfaction (%)	All	No data	

Note: Data were presented as mean (standard deviation) or n (%).

Abbreviations: ED, emergency department; HaH, Hospital at Home; NTD, New Taiwan Dollars.

Table 3 Logistic Regression Analysis of Length of Stay, Medical Expenditure, ED Visits, and Rehospitalizations Between HaH and Comparison Cohort

Outcome (HaH vs Comparison)	Crude OR (95% CI)	p-value	Adjusted OR* (95% CI)	p-value
Length of stay (day)				
≤7.5 [†]	Reference		Reference	
>7.5	0.53 (0.31–0.90)	0.020	0.53 (0.30–0.93)	0.028
Medical expenditure (NTD)				
≤29209.9 [†]	Reference		Reference	
>29209.9	0.20 (0.11–0.35)	<0.001	0.18 (0.10–0.33)	<0.001
ED visit				
< 3 days				
No	Reference		Reference	
Yes	1.55 (0.39–6.17)	0.532	1.26 (0.30–5.34)	0.752
<14 days				
No	Reference		Reference	
Yes	1.44 (0.27–7.58)	0.668	1.03 (0.18–5.89)	0.974
Rehospitalization				
< 3 days				
No	Reference		Reference	
Yes	1.06 (0.46–2.46)	0.885	1.01 (0.43–2.38)	0.989
<14 days				
No	Reference		Reference	
Yes	1.43 (0.57–3.58)	0.444	1.31 (0.51–3.36)	0.578

Notes: *Multiple models adjusted for activity of daily living, cerebrovascular disease, and dementia. [†]Using the mean of the HaH cohort as the cutoff point.

Abbreviations: ED, emergency department; OR, odds ratio; CI, confidence interval; NTD, New Taiwan Dollars.

Among the 69 HaH patients, the most common diagnoses were pneumonia (37.7%), UTI (46.4%), and soft tissue infection (15.9%) ([Supplementary Table 1](#)). Age and sex distribution were similar across groups. Patients with soft tissue infections had higher ADL scores ($p < 0.001$), while diabetes was more common in UTI and soft tissue infection groups ($p = 0.030$). Among patients in the HaH group, those with pneumonia had longer stays [median 8.5 days (IQR: 8.0–9.0)] compared to patients with UTI [median 7.0 days (IQR: 7.0–7.0)] and soft tissue infection [median 6.5 days (IQR: 6.0–7.0)] ($p < 0.001$), and incurred higher medical costs ($p < 0.001$) ([Supplementary Table 2](#)). ED revisits and rehospitalization rates were similar across groups (all $p > 0.05$). Among HaH patients, 16 (23.2%) were from HHC

and 53 (76.8%) from the ED ([Supplementary Table 3](#)). The HHC group had lower ADL scores (21.3 vs 56.7, $p < 0.001$) and more cerebrovascular disease (56.3% vs 22.6%, $p = 0.015$). Medical costs were slightly lower in the HHC group, but ED revisit and rehospitalization rates were comparable (all $p > 0.05$) ([Supplementary Table 4](#)).

Discussion

This study demonstrated that HaH care resulted in shorter hospital stays and lower medical expenditures compared to traditional hospitalization, without increasing the risks of ED revisits or rehospitalization. HaH patients had lower odds of prolonged hospitalization and reduced medical expenses, while maintaining clinical stability. A significantly higher proportion of HaH patients transitioned to HHC, suggesting better continuity of care. Patient and caregiver satisfaction was notably high, further supporting HaH as a well-accepted alternative to inpatient hospitalization. These findings highlight HaH's potential to optimize healthcare resource utilization while maintaining quality and patient-centered care.

Our findings are broadly consistent with international HaH studies, which have also demonstrated reductions in length of stay and healthcare costs without compromising patient safety.^{16–18} For example, Levine et al in the United States found that HaH patients had shorter stays and similar safety outcomes compared with traditional hospitalization.¹⁷ Similarly, systematic reviews from Europe and Australia reported improved patient satisfaction and cost savings associated with HaH.¹⁹ However, differences in regional implementation, patient selection, and healthcare financing may influence outcomes. Unlike many Western programs that integrate both admission avoidance and early supported discharge, the pilot in Taiwan adopted only the admission avoidance model, which may limit direct comparability. In addition, cultural expectations, caregiver availability, and Taiwan's single-payer reimbursement framework may explain the particularly high patient and caregiver satisfaction observed in our cohort.

The reduction in length of stay and medical expenditure may be attributed to the structured care model, interdisciplinary team approach, and remote monitoring technologies.¹⁷ Daily nursing visits and virtual physician consultations ensured timely decision-making and early intervention.¹⁷ The use of once-daily IV antibiotics (ceftriaxone, moxifloxacin, levofloxacin, and ertapenem) enhanced feasibility and minimized logistical challenges. Additionally, IoT-based remote monitoring enabled continuous assessment of vital signs, allowing proactive adjustments in care.²⁰ These factors contributed to HaH's efficiency, reducing hospital resource utilization while maintaining comparable rates of ED revisits and rehospitalizations.²¹

The successful implementation of HaH in this study highlights its potential as a scalable model for healthcare systems facing capacity constraints and aging populations.⁴ With growing demand for acute care services due to aging and chronic disease prevalence, HaH provides an effective alternative to hospital overcrowding while maintaining quality care.¹⁶ Research suggests HaH can reduce healthcare costs by 30% or more, making it an attractive model for resource-limited settings.¹⁶ Telemedicine, remote monitoring, and interdisciplinary care teams further enhance HaH's feasibility beyond tertiary centers, supporting broader adoption across various healthcare infrastructures.²² However, policy support, standardized reimbursement frameworks, and workforce training programs are essential for scaling HaH successfully.²³

While this pilot program focused on three infections (pneumonia, UTI, and soft tissue infection), expanding HaH services to other acute conditions could further enhance hospital efficiency and reduce healthcare burden. Potential areas for expansion include early supported discharge programs, acute exacerbations of COPD or heart failure, dengue fever management, chemotherapy administration, and hemodialysis support at home.¹⁹ Studies suggest that HaH for COPD exacerbations and heart failure can improve patient outcomes while lowering costs, and home-based chemotherapy has been feasibly integrated into hospital alternatives in some settings.¹⁸ Future research should evaluate the safety, feasibility, and cost-effectiveness of extending HaH to these populations, as well as developing protocols to ensure optimal patient selection and care delivery.

HaH implementation in Taiwan could address critical healthcare challenges, such as ED overcrowding and nurse shortages.²² ED congestion has reached unprecedented levels due to insufficient inpatient beds and workforce shortages, forcing hospitals to restrict bed availability.²⁴ Taiwan faces an annual deficit of 5000 hospital nurses, further straining healthcare services.²⁴ HaH and HHC can reduce inpatient demand, optimizing existing workforce utilization and facilitating care in community settings.²² Moreover, HaH and HHC strengthen healthcare resilience, which has become

a common global priority in the post-COVID era. By decentralizing care delivery, they also enhance crisis preparedness and help ensure continuity of services during emergencies.

Despite its advantages, several barriers remain for broader HaH implementation in Taiwan. Limited physician and nurse availability may restrict scalability, as home-based care still requires specialized training and staffing.^{25,26} Reimbursement models must be refined to ensure long-term financial viability, incentivizing hospitals to adopt HaH services.²⁷ Patient and caregiver acceptance may also vary, with some preferring traditional hospital settings due to perceived safety concerns or caregiver limitations.²⁸ Additionally, telemedicine and remote monitoring infrastructure must be expanded, particularly in rural or resource-limited areas.²⁹ Overcoming these challenges through policy adjustments, workforce investment, and public awareness will be essential for establishing HaH as a sustainable model in Taiwan.

Although this study primarily compared HaH vs traditional hospitalization, subgroup analysis revealed notable differences. Pneumonia patients had longer hospital stays and higher medical costs than those with UTI or soft tissue infections, likely due to more intensive monitoring and treatment needs. Patients admitted via HHC and ED also had distinct baseline characteristics, with HHC patients having lower ADL scores and higher cerebrovascular disease prevalence, yet similar clinical outcomes. These findings suggest that certain patient populations may require tailored HaH care approaches. However, given the small sample size, further studies are needed to validate these subgroup differences.

This study has several strengths. It is the first study evaluating HaH implementation in Taiwan, providing evidence of its effectiveness in reducing length of stay and costs while maintaining clinical stability. These findings serve as an important reference for HaH adoption globally, especially in aging populations and resource-limited settings. Additionally, its real-world retrospective design reflects practical clinical outcomes, making it relevant for healthcare policy and decision-making. However, limitations should be acknowledged. The small sample size may limit generalizability, requiring larger, multicenter studies for validation. Additionally, the retrospective design may introduce selection bias, warranting prospective randomized trials for further evaluation. This pilot program focused exclusively on admission avoidance, in which patients were admitted directly to HaH from the community or ED. Early supported discharge, another widely used HaH model, was not included. As a result, our findings may not be fully generalizable to HaH programs that integrate both admission avoidance and early supported discharge approaches. Finally, long-term outcomes, such as functional recovery, quality of life, and long-term healthcare utilization, were not assessed and should be explored in future research.

Conclusion

This study demonstrates that HaH is an effective alternative to hospitalization, reducing length of stay and medical expenditure while maintaining high patient satisfaction and clinical stability. These findings support HaH's feasibility and benefits in Taiwan, emphasizing its role in healthcare resilience and resource optimization. Expanding HaH beyond its current focus on pneumonia, UTI, and soft tissue infections to include conditions such as COPD exacerbations, heart failure, dengue fever, chemotherapy, hemodialysis, and early supported discharge could further enhance healthcare efficiency and patient-centered care. Future research should explore the safety, feasibility, and cost-effectiveness of these expansions. Further large-scale studies and policy support are essential to broaden HaH implementation, refine its integration into Taiwan's healthcare system, and establish it as a sustainable, scalable model for acute care delivery.

Data Sharing Statement

The datasets used and analyzed during this study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of CMMC. To protect patient privacy, all data were anonymized. Given the retrospective and observational nature of the study, the requirement for informed consent was waived by the IRB. This waiver did not affect patient welfare.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflicts of interest.

References

1. Ageing and health. 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>. Accessed February 23, 2025.
2. Population projections for the R.O.C. (Taiwan). 2025. Available from: https://pop-proj.ndc.gov.tw/main_en/. Accessed February 23, 2025.
3. Chien SC, Chang YH, Yen CM, et al. Understanding and alleviating informal caregiver burden through the development and validation of a caregiver strain index-based model in Taiwan. *BMC Geriatr*. 2024;24(1):558. doi:10.1186/s12877-024-05136-5
4. Kanagala SG, Gupta V, Kumawat S, Anamika F, McGillen B, Jain R. Hospital at home: emergence of a high-value model of care delivery. *Egypt J Intern Med*. 2023;35(1):21. doi:10.1186/s43162-023-00206-3
5. Patel HY, West DJ Jr. Hospital at home: an evolving model for comprehensive healthcare. *Glob J Qual Saf Healthc*. 2021;4(4):141–146. doi:10.36401/JQSH-21-4
6. National health insurance home-based acute care pilot program. 2025. Available from: <https://www.nhi.gov.tw/ch/np-3658-1.html>. Accessed February 23, 2025.
7. Emergency geriatric care. 2025. Available from: <http://sub.chimei.org.tw/57900/index.php/en-specially/en-specially3>. Accessed March 2, 2025.
8. Hsu SL, Tsai KT, Tan TH, et al. Interdisciplinary collaboration and computer-assisted home healthcare referral in the emergency department: a retrospective cohort study. *Aging Clin Exp Res*. 2022;34(8):1939–1946. doi:10.1007/s40520-022-02109-9
9. Tan TH, Yang TY, Chen YM, et al. Computerized tool and interdisciplinary care for older patients with delirium in the emergency department: a novel model in Taiwan. *Aging Clin Exp Res*. 2022;34(12):3137–3144. doi:10.1007/s40520-022-02240-7
10. Hsu HL, Ho CH, Lin YJ, et al. Developing a novel transitional care model for older emergency department patients and exploring the target population in Taiwan. *Front Med*. 2024;11:1444724. doi:10.3389/fmed.2024.1444724
11. Chang HT, Lai HY, Hwang IH, Ho MM, Hwang SJ. Home healthcare services in Taiwan: a nationwide study among the older population. *BMC Health Serv Res*. 2010;10:274. doi:10.1186/1472-6963-10-274
12. Ho YC, Wang CT, Weng TC, et al. Impact of the home-based medical integrated program on health outcomes and medical resource utilization in home healthcare patients in Taiwan. *Clin Interv Aging*. 2024;19:1437–1444. doi:10.2147/CIA.S457281
13. President lai inspects nhi's acute hospital care at home program to enhance home medical care systems for aging in place. 2024. Available from: <https://www.nhi.gov.tw/en/cp-15373-8c9c2-8-2.html>. Accessed March 2, 2025.
14. The recommendations of empirical parenteral antibiotics for infectious diseases out of hospital in Taiwan, 2024. 2024. Available from: <https://www.nhi.gov.tw/ch/cp-15309-20bbf-3660-1.html>. Accessed August 31, 2025.
15. Hennessy S, Bilker WB, Berlin JA, Strom BL. Factors influencing the optimal control-to-case ratio in matched case-control studies. *Am J Epidemiol*. 1999;149(2):195–197. doi:10.1093/oxfordjournals.aje.a009786
16. Chafetz. JABCAL. Designing and launching hospital-at-home models: strategic imperatives for health system leaders. 2022. Available from: <https://www.manatt.com/insights/newsletters/health-highlights/designing-and-launching-hospital-at-home-models-st>. Accessed March 2, 2025.
17. Levine DM, Paz M, Burke K, et al. Remote vs in-home physician visits for hospital-level care at home: a randomized clinical trial. *JAMA Network Open*. 2022;5(8):e2229067. doi:10.1001/jamanetworkopen.2022.29067
18. Pandit JA, Pawelek JB, Leff B, Topol EJ. The hospital at home in the USA: current status and future prospects. *NPJ Digit Med*. 2024;7(1):48. doi:10.1038/s41746-024-01040-9
19. Williams S, Morrissey AM, Steed F, et al. Early supported discharge for older adults admitted to hospital with medical complaints: a systematic review and meta-analysis. *BMC Geriatr*. 2022;22(1):302. doi:10.1186/s12877-022-02967-y
20. Abdulmalek S, Nasir A, Jabbar WA, et al. IoT-based healthcare-monitoring system towards improving quality of life: a review. *Healthcare*. 2022;10(10):1993. doi:10.3390/healthcare10101993
21. Klein S. “hospital at home” programs improve outcomes, lower costs but face resistance from providers and payers. 2024. Available from: <https://www.commonwealthfund.org/publications/newsletter-article/hospital-home-programs-improve-outcomes-lower-costs-face-resistance>. Accessed March 2, 2025.

22. 5 lessons learned about hospital at home programs. 2024. Available from: <https://www.healthrecoveryolutions.com/resources/white-paper/hospital-at-home#>. Accessed March 2, 2025.
23. Fact sheet: extending the hospital-at-home program. 2025. Available from: <https://www.aha.org/fact-sheets/2024-08-06-fact-sheet-extending-hospital-home-program>. Accessed March 2, 2025.
24. Lee IC. ER overcrowding unprecedented: medical group. 2025. Available from: <https://www.taipeitimes.com/News/front/archives/2025/02/24/2003832393>. Accessed March 2, 2025.
25. Lin CF, Chang PJ, Chang HM, et al. Evaluation of a telemonitoring system using electronic national early warning scores for patients receiving medical home care: pilot implementation study. *JMIR Med Inform*. 2024;12:e63425.
26. Tai PC, Chang S. Exploring internal conflicts and collaboration of a hospital home healthcare team: a grounded theory approach. *Healthcare*. 2023;11(18):2478. doi:10.3390/healthcare11182478
27. Kodiak T, Quinn M, Zekas L. Current state of home health in children with medical complexity. *J Pediatr Nurs*. 2024;77:180–182. doi:10.1016/j.pedn.2024.03.009
28. Liu CC, Lee CF, Chang T, Liao JJ. Exploring the relationship between the caregiver's stress load and dementia patient behavior: a case study of dementia specialist outpatient data from the southern medical center of Taiwan. *Int J Environ Res Public Health*. 2020;17(14).
29. Lin CC, Yang CT, Su PL, Hsu JL, Shyu YL, Hsu WC. Implementation difficulties and solutions for a smart-clothes assisted home nursing care program for older adults with dementia or recovering from hip fracture. *BMC Med Inform Decis Mak*. 2024;24(1):71. doi:10.1186/s12911-024-02468-5

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