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Integrated long-term care model for dependent elderly in Mahasarakham Province, Thailand

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ABSTRACT

Background: Long-term care (LTC) for dependent elderly individuals encompasses a wide range of medical, personal, and social services designed to meet their physical, emotional, and psychological needs over an extended period.

Objective: This study aimed to develop and evaluate an integrated long-term care model for dependent elderly individuals in Mahasarakham Province.

Materials and methods: A mixed-methods research design divided into three phases: Phase 1 focused on identifying the problems and care needs of dependent elderly individuals; Phase 2 involved the development of an integrated care model; and Phase 3 involved the implementation and evaluation of the model. The Geographic Information Systems (GIS) application was crucial for identifying where care support was needed. The study included 95 elderly participants and seven caregivers. Data was collected using questionnaires and structured interviews.

Results: The study included 60% female and 40% male participants, with the majority (34.74%) falling within the age more than 75 years. Hypertension was as the most prevalent underlying condition, affecting 42.11% of the sample. In terms of elderly dependency, 8.42% of participants were severe dependency, while 6.32% were deemed completely dependent. The Barthel ADL Index analysis showed that the average score for daily living activities before care was 6.56 (with a standard deviation of 4.64), and this score went up to 10.22 (with a standard deviation of 8.19) after receiving care. Additionally, caregivers' knowledge regarding elderly dependency care showed significant improvement following a structured training program. The mean score of caregiver knowledge increased after the training, with the change being statistically significant.

Conclusion: This model highlights its potential for broader application, offering a promising approach to improving the quality of life for the elderly by enhancing their ability to perform ADL activities. By integrating this program into local and regional healthcare strategies, it will contribute to the overall healthcare campaign, fostering improved health outcomes and a higher quality of life for dependent elderly people.

Introduction

The global population is undergoing a significant demographic shift, with a rapid increase in the aging population. This trend reflects advancements in healthcare, improved living conditions, and declining fertility rates. By 2022, it was estimated that the global elderly population reached 1.1 billion, accounting for 14% of the total global population of 8 billion.[1] By 2050, this number is expected to double, posing substantial social, economic, and healthcare challenges worldwide.[2]

In Thailand, the aging population has grown substantially over the past few decades. In 2022, Thailand's population was recorded at 66 million, based on civil registration data from the Ministry of Interior. Among them, 13 million individuals were aged 60 or older, representing 19% of the total population.[3] By 2040, it is projected that 32.1% of the Thai population will be elderly, marking Thailand as a super-aged society.[4] This rapid demographic change necessitates urgent reforms in healthcare services, particularly in long-term care systems, to support the growing number of elderly individuals with physical, mental, and social vulnerabilities.

The trend is equally evident in Health Region 7 of Thailand, where the elderly population grew from 21.19% in 2021 to 23.79% in 2024.[5] Within this region, Mahasarakham Province, with a total population of 664,651, has 167,528 elderly individuals, constituting 25.2% of its population.[6] Among them, 17,017 are categorized as dependent elderly due to chronic illnesses, disabilities, or other conditions requiring continuous care. Kantharawichai District, one of the province's administrative areas, alone has 1,001 dependent elderly individuals, or 5.88% of the district's population. These individuals often face significant challenges, including social isolation, inadequate access to healthcare services, and difficulties managing chronic diseases.[5]

The study explores the integration of long-term care services for dependent elderly individuals in the Na Sinuan community through the innovative application of Geographic Information Systems (GIS). This approach is intended to optimize resource allocation and improve the efficiency of care delivery systems, thereby addressing the unique challenges faced by dependent elderly populations in rural settings.

Materials and methods
Study design
This study employed a mixed-methods approach, combining research and development (R&D) techniques, to design a care model for the elderly with dependency due to non-communicable chronic diseases. The model was developed using Deming's cycle theory[7] (PDCA: Plan-Do-Check-Act).

Study procedure
Phase 1: *Identifying problems and care needs for dependent elderly.*
Conduct a comprehensive review of literature and organize focus group discussions to identify problems and care models of dependent elderly in Mahasarakham Province. A questionnaire was applied to 95 purposively sampled patients; this study targeted elderly individuals with dependency who had been diagnosed by physicians with diabetes, hypertension, asthma, and others. The assessment focused on measuring the ability of these dependent elderly individuals to perform ADLs.

Phase 2: *Model development.*
This phase builds on the findings from Phase 1, which

identified policies and issues related to the care needs of dependent elderly with chronic non-communicable diseases in Mahasarakham Province. The goal is to design a care model for the caregivers and elderly, it seems that addresses these needs effectively. The procedure of action research included:

2.1   Conducting a situation analysis of the study area and collect baseline data on elderly individuals with dependency, focusing on their potential, self-care abilities, and care needs. This will be achieved through interviews.

2.2   Employing the action research (AR) methodology based on the framework. The study incorporates empowerment theory and the health belief model to design activities using the quality development process guided by the Deming Cycle (PDCA).

2.3   Focus group discussions and small group meetings (multiple focus group discussions) to understand the context and care needs of elderly individuals with dependency in the context of NCDs in Mahasarakham Province. The project involved collaboration with network partners and stakeholders, including seven caregivers and 95 elderly individuals with dependency. Data will be collected through audio recordings.

2.4   Developing a care model for elderly individuals with dependency in the context of NCDs.
Step 1: Preparation phase (Plan)
This step focused on understanding the process and preparing the target group before starting the intervention.

Step 2: Implementation phase (Do)
This step involved a collaborative learning process, focusing on educating stakeholders about dependent elderly individuals with chronic non-communicable diseases. The development activities follow a structured four-step approach.

D1: Empowerment of elderly individuals and caregivers:
Enhance the capabilities of elderly individuals and caregivers to care for themselves and others by organizing community and family learning activities with the following initiatives: empowering dependent elderly individuals through group sessions held twice a week, each lasting 90-120 minutes, for five weeks; and conducting workshops for caregivers, specifically targeting long-term care managers (CM), to strengthen community-based services that support elderly individuals at the family and community levels.

D2: Development of elderly care systems:
Establish a comprehensive care system that included health screening, medical treatment, referral systems, and community-based health

care services, while conducting educational activities, media exchanges, and interactive health workshops under the program "Healthy Aging Care" to promote health awareness and support.

D3: Testing the developed model:
A quasi-experimental research design, which involved comparing the mean differences in the scores for daily activity performance ability, measured twice—once before and once after participation in the program.

D4: Development of innovations for elderly Care:
Create home-visit initiatives for elderly individuals who remained homebound, ensuring direct interaction and support through consistent visited that strengthen engagement and provide practical assistance in maintaining health and well-being.

Step 3: Observing sustainability (Check)
Researchers observed and documented the implementation of care activities, examining the lifestyle and adherence to the developed care model among elderly individuals with chronic non-communicable diseases.

Step 4: Reflection on model development (Act)
Reflecting on the effectiveness and efficiency of the developed care model in the context of dependent elderly individuals with chronic non-communicable diseases in Mahasarakham Province, evaluating outcomes and areas for improvement.

Phase 3: *Model implementation and evaluation*
A quasi-experimental research design was employed, comparing the mean differences in the scores of ADL abilities measured twice—before and after participation in the program. The study utilized purposive sampling, focusing on elderly individuals with dependency in the context of NCDs and their caregivers. The 95 dependent elderly and 7 trained caregivers in purposive sampling of, totaled 102 participants.

The target groups were selected based on the following criteria:
Elderly group
Participants included elderly individuals of both genders, aged 60 years and older, with an ADL score of less than 12, as defined by the Guidelines for Screening and Health Assessment of the Elderly.[8] Eligible participants were required to hold Universal Coverage (UC) scheme rights registered with the local administrative organization, reside in the target research area at the time of data collection, demonstrate a willingness to participate voluntarily, and

be classified as dependent elderly with chronic conditions such as diabetes or hypertension, etc.

Caregiver group
The primary caregiver was defined as an individual responsible for assisting the elderly with basic self-care activities and actively fulfilling this role at the time of the study. Eligible caregivers provided care for elderly individuals covered under the Universal Coverage Scheme, resided in the same household as the dependent elderly individual, and could be either related (e.g., child, son/daughter-in-law, spouse, grandchild, sibling) or community caregivers. Additionally, caregivers needed to be able to communicate effectively and demonstrate a willingness to participate voluntarily as research informants.

The following steps in Phase 3 were undertaken.
1.1 Enhance the capacity of personnel in providing care for elderly individuals with dependency in the context of NCDs. This was achieved through a hands-on workshop aimed at empowering both the dependent elderly and their family caregivers.
1.2 Conduct focus group discussions and community forums to promote participation and transparency in elderly care through the collaboration of community network partners.
1.3 Organize knowledge-sharing sessions to facilitate the exchange of ideas and the development of innovations for caring for dependent elderly individuals, focusing on knowledge transformation and sustainability.
1.4 Evaluate outcomes using interviews to assess the ability of elderly individuals to perform ADLs.

Data analysis
The demographic data was analyzed using descriptive statistics and presented through frequency, percentage, mean, standard deviation, minimum, and maximum values. The differences in ADL scores were compared using the dependent t-test or paired t-test.

Results
Demographic characteristics
A total of 95 elderly participants, 60% of whom were female, and 40% of whom were male. The age distribution revealed a predominance of individuals aged more than 75 years (34.74%). For the underlying disease found 42.11% of the sample had hypertension, 29.47% had diabetes, 20% experienced a combination of both hypertension and diabetes, as well as asthma (5.26%) and chronic obstructive pulmonary disease (3.16%) Regarding socio-economic factors, a substantial portion of participants were widowed (73.68%) and had received only primary education (76.84%), as shown in Table 1.

Table 1. Socio-demographic data of the elderly with dependency (N=95).

Socio-demographic data	Number (N=95)	Percentage (%)
Sex		
Male	38	40.00
Female	57	60.00
Age		
60-65 years	25	26.31
66-70 years	21	22.11
71-75 years	16	16.84
More than 75 years	33	34.74
Underlying diseases		
Hypertension	40	42.11
Diabetes	28	29.47
Both hypertension and diabetes	19	20.00
Asthma	5	5.26
Chronic obstructive pulmonary disease	3	3.16
Marital status		
Single	5	5.27
Married	18	18.95
Widowed	70	73.68
Divorced	2	2.10
Education		
Not educated	14	14.74
Primary school	73	76.84
Higher than primary school	8	8.42

Elderly dependency classification

The dependency levels among elderly participants were classified based on their ability to perform daily living tasks, assessed using the Barthel Activities of Daily Living (ADL) Index, a standardized tool widely applied in geriatric assessments to determine functional independence.[9] The findings reveal that 6.32% of participants exhibited high dependency, necessitating considerable assistance in their daily activities. In comparison, demonstrated moderate dependency (30.53%), while a smaller group (8.42%), was classified as severely dependent (Table 2). These results presented significant issues as they highlight the varying degrees of dependency within the elderly population and emphasize the necessity for personalized care strategies, with a substantial number of individuals requiring extensive care support, and intervention tailored to their specific needs. These outcomes underscore the necessity of integrating comprehensive care strategies that indicated the varying dependency levels and chronic diseases prevalent among the elderly in the study. Moreover, the high prevalence of chronic diseases such as hypertension and diabetes indicated the importance of targeted healthcare interventions to improve the quality of life for these individuals.

Table 2. Elderly dependency classification.

Symptom group level	Number	%
Mildly dependent	52	54.74
Moderate dependency	29	30.53
Severe dependency	8	8.42
Complete dependency	6	6.32
Total	**95**	**100.00**

Barthel ADL index analysis

The comparison of the mean differences of performing the activities of daily living, with the Barthel ADL Index, among the elderly revealed the following results: The mean score of ADL ability before receiving care was 6.56 (SD=4.640), whereas the mean score after receiving care increased to 10.22 (SD=8.197). This indicates that the ADL ability scores of the elderly after receiving care were significantly higher than those before receiving care, (p=0.026), as shown in Table 3.

The knowledge of elderly dependency care among caregivers

Following the development of caregiving skills was performed among seven caregivers responsible for elderly individuals with dependency and NCDs. Based on the knowledge assessment, this found that the mean score of ten-point knowledge before the skill development training was 54.05 (SD=8.351). After the training, the mean score increased to 65.80 (SD=2.587). This indicated a statistically significant improvement in knowledge levels following the training (p=0.00), as presented in Table 4.

Table 3. Ability to perform activities of daily living (ADL) among the elderly before and after the care intervention (N=95).

| Group	Number	Min	Max	Mean	SD	t	p value
Before	95	0	11	6.56	4.640	2.668	0.026*
After	95	4	15	10.22	8.197		

Table 4. Knowledge of elderly dependency care before and after Intervention in care giver.

Group	Number	Min	Max	Mean	SD	p value
Before	7	42	68	54.05	8.351	0.000*
After	7	59	73	65.80	2.587	

Elderly decent care with non-communicable disease model
     A total of 95 elderly individuals with dependency conditions within the NCD group was selected. Their LTC conditions were assessed, focusing on health status evaluation using ADL scores and identifying care needed for the elderly in the LTC group with NCD. A GIS was employed to record the location of the homes of the LTC-dependent elderly. The type of elderly individuals in LTC was visualized based on their ADL score groups, represented with different colors: blue, green, orange, and red. Additionally, the locations of trained CG were marked as yellow stars. This mapping supported the planning for appropriate assistance for dependent elderly individuals, as presented in Figure 1.
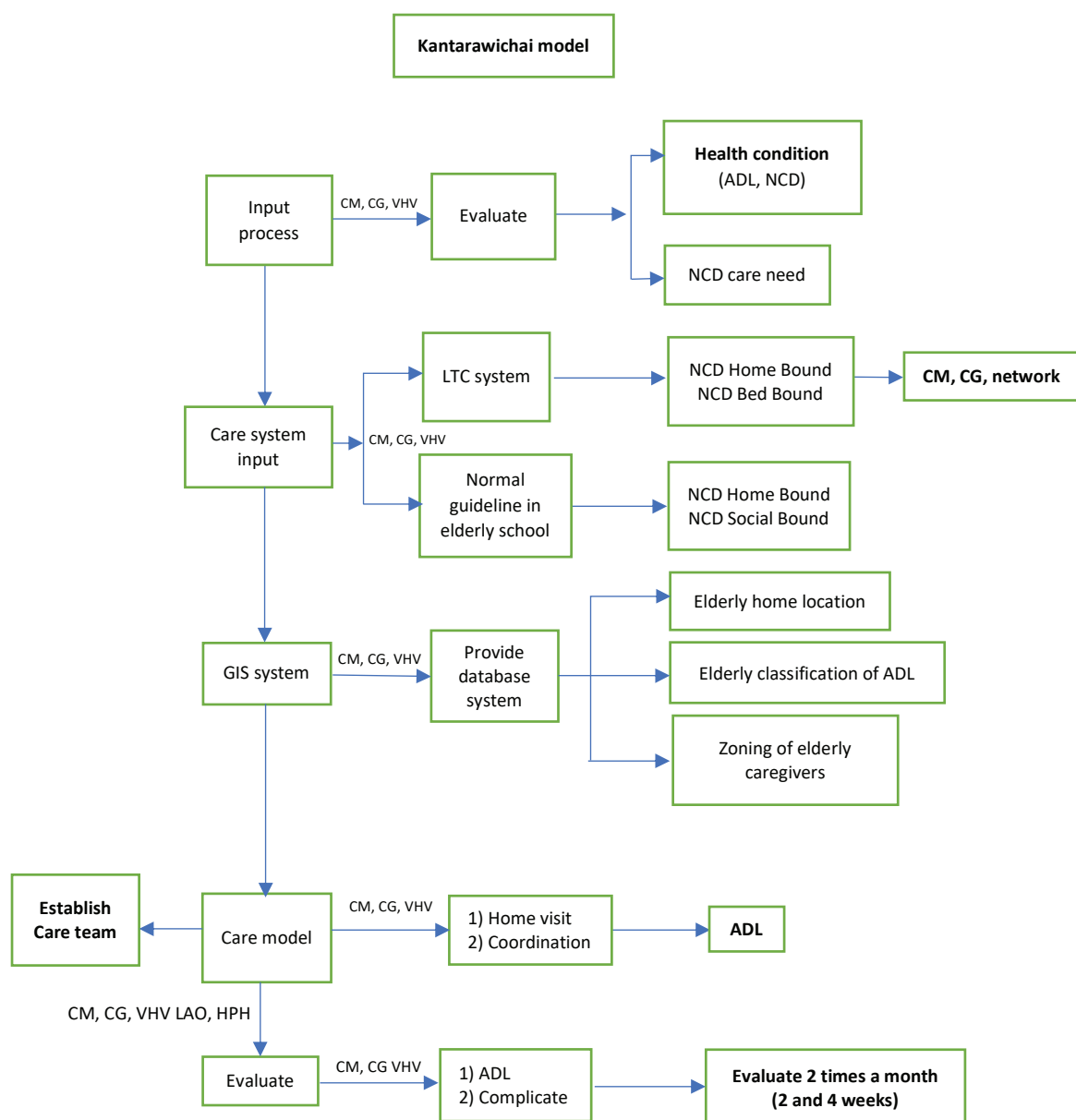

Figure 1. *Kantharawichai elderly dependency care model. CM: care manager, CG: care giver, VHV: village health volunteer, LAO: local administrative organization, HPH: health promoting hospital.*

Distribution of caregivers to support elderly dependency care

The analysis of caregiver distribution for elderly dependency care revealed a strong correlation between the proximity of caregivers' residences to elderly individuals' homes and the frequency of visits. Caregivers residing closer to elderly individuals provided care at a frequency surpassing the government service criteria by 100%. This finding underscores the critical role of geographic proximity in determining accessibility and quality of caregiving interactions. Visual representation of the data (Figure 2) further demonstrated that caregiver proximity significantly enhances care delivery effectiveness for the dependent elderly population. These findings highlighted geographic factors as pivotal in the design of effective caregiving models, particularly for elderly individuals with chronic conditions requiring sustained support. The results align with the overarching objective of this study—to develop improved long-term care strategies tailored to the needs of dependent elderly populations. Additionally, the importance of incorporating spatial considerations into policy and practice frameworks was to optimize caregiving efforts.
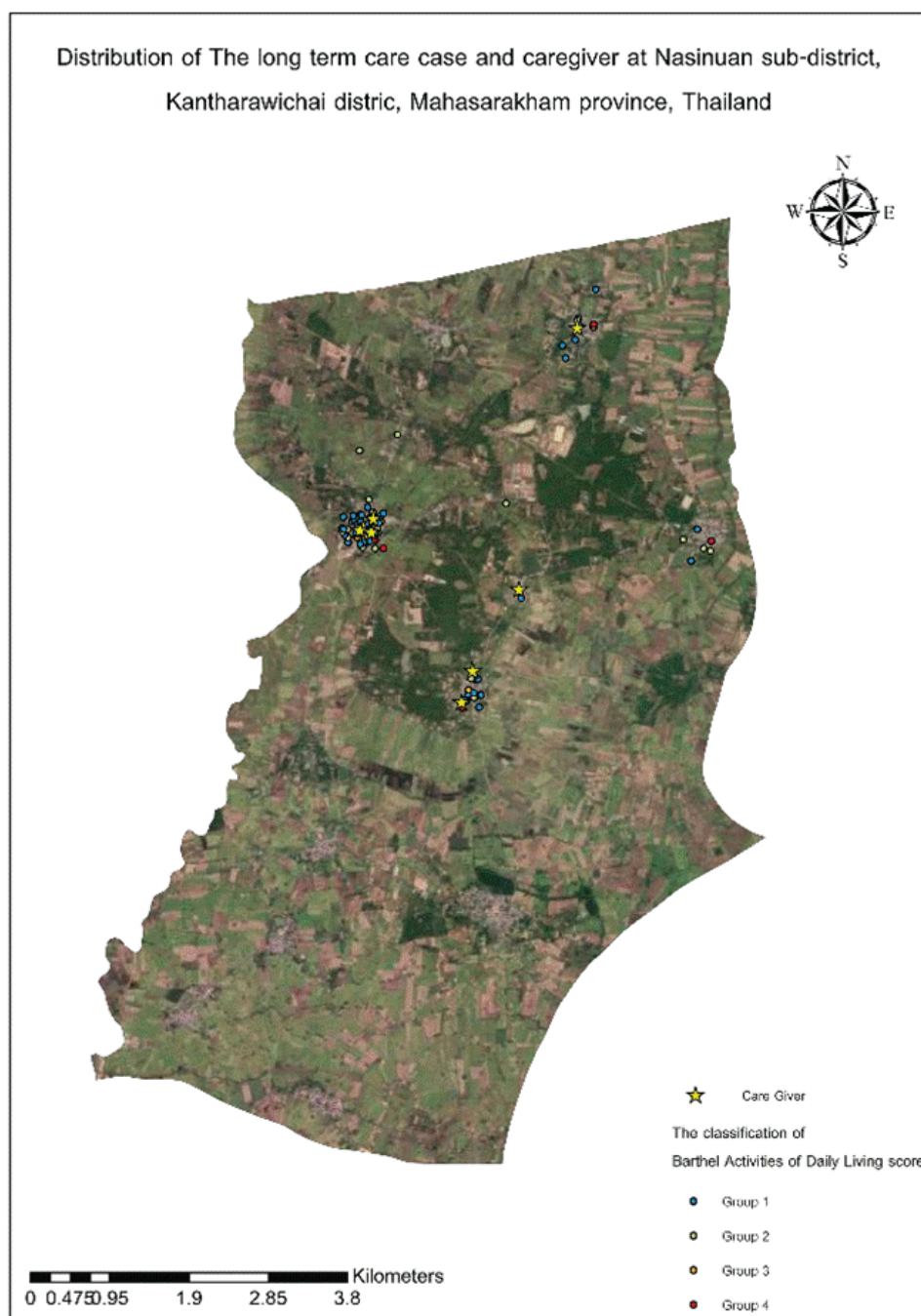
Figure 2. *Geographic proximity of caregivers' residences to elderly individuals' homes and dependency levels.*

Discussion

The current study aimed to develop and assess an integrated long-term care model for dependent elderly individuals with NCDs in Mahasarakham Province, Thailand. The findings suggested that the implemented care model led to significant improvements in the daily living abilities of the elderly participants. These results align with existing literature that demonstrated the efficacy of integrated care models in improving the quality of life for elderly individuals with chronic conditions. In the sometime, there have similarly shown that integrated care approaches, which combine healthcare services, social support, and community resources, contribute significantly to better health outcomes, reduced hospital admissions, and enhanced social engagement among the elderly population.[10,11] Such models provide continuous support and improve communication between caregivers, healthcare professionals, and elderly individuals, thereby fostering trust.[12] The positive outcomes in this study suggested that implementing and scaling such models across other regions could be beneficial, particularly in areas with high elderly populations and limited healthcare infrastructure. It also highlights the importance of local community involvement and caregiver proximity, which are crucial factors in maintaining consistent and accessible care delivery. Continued research and policy support should focus on scaling integrated models while considering community-specific geographic and socio-economic factors to optimize care delivery for elderly populations with NCDs.[13]

In comparison with existing literature, our study provided a more focused examination of elderly individuals living with NCDs, such as diabetes, hypertension, and asthma, while incorporating caregivers as a central component of the care delivery model. While studies have highlighted the importance of comprehensive care systems for elderly populations, our research delves deeper into the specific challenges of managing chronic diseases among dependent elderly individuals.[14,15] Notably, many previous studies have taken a broader approach to elderly care, often overlooking the intricate complexities of chronic disease management and the direct involvement of CG in these contexts. Our study distinguishes itself through the integration of a caregiver training program, which serves as a crucial factor in sustaining care delivery in community-based settings. This approach aligns with the findings that emphasized the necessity of equipping caregivers with the knowledge and skills to address the multifaceted health needs of elderly individuals living with chronic illnesses.[16] Such training programs ensured that caregivers can provide more effective, continuous, and personalized care, ultimately improving health outcomes and quality of life for dependent elderly populations. The model's applying community-based volunteers and leveraging GIS technology for care coordination, has been shown to enhance accessibility and efficiency in care delivery, which could be further expanded and adapted in other regions.

However, this study has several limitations. First, the sample size, although appropriate for the context of this research, is relatively small, limiting the ability to generalize findings on a larger scale. Furthermore, the study was conducted within a single geographical region, which may not fully represent the diverse elderly populations in other parts of Thailand or internationally. This limitation highlights the need for multi-center studies to validate the model's effectiveness across different settings. Additionally, while the model showed promising results, further research is needed to explore its long-term sustainability and the potential impact of ongoing caregiver training and support.

Moreover, while the study measured improvements in daily living abilities, it did not assess the cost-effectiveness of the model. This is an important factor to consider in evaluating the feasibility of scaling the model across other regions or countries. By addressing these limitations in future research endeavors, we can better refine the community-based models, develop scalable interventions, and ultimately enhance the well-being of elderly populations across Thailand and beyond.

In terms of further research, it would be beneficial to explore the impact of this care model on the mental health of elderly individuals, as well as the role of technology in enhancing care delivery. Studies focusing on the mental health outcomes of elderly individuals receiving integrated care have shown promising results,[17] and future research could integrate these aspects into the existing care model. Additionally, expanding to other regions of Thailand or internationally would provide a more comprehensive understanding of the model's scalability and adaptability in different socio-cultural contexts.

Finally, the Long-Term Care (LTC) model for dependent elderly in this study was designed to address their comprehensive care needs by integrating medical, social, and psychological support. This model emphasizes enhancing the ability of elderly individuals to perform activities of daily living (ADL), such as bathing, dressing, and mobility, which are essential for maintaining autonomy and reducing caregiver burden. Improving ADL capabilities is a critical outcome of the LTC model, as it directly correlates with the quality of life (QoL) of dependent elderly individuals. When ADL performance improves, elderly individuals experience greater independence, reduced stress, and enhanced social participation, leading to better physical and mental well-being.[18] Furthermore, the effectiveness of LTC models including caregiver support and community involvement ensures that care is sustainable, personalized, and responsive to the evolving needs of the elderly, and further enhancing their QoL.[19]

Conclusion

This study contributes valuable insights into the development and implementation of an integrated long-term care model for elderly individuals with chronic non-communicable diseases. The results demonstrates that the model can improve daily living abilities, offering

a promising solution for enhancing the quality of life for dependent elderly. Further research, including multi-center trials and cost-effectiveness analyses, is essential for determining the broader applicability and long-term viability of this care model.

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