

Factors Influencing Health Service Provision for Supporting Self-Management among Type 2 Diabetes Patients in Health Region 2, Thailand

Porntep Chotchaisuwat, MD, MPH¹, Civilaiz Wanaratwichit, DrPH¹

¹ Faculty of Public Health, Naresuan University, Phitsanulok, Thailand

Background: Diabetes prevalence in Health Region 2, Thailand, is rising, while effective glycemic control among patients remains inadequate. Enhancing self-management among patients is essential to prevent complications and improve health outcomes. However, the factors contributing to the success of health service provision for supporting self-management of patients with diabetes have not been fully explored.

Objective: To identify key factors influencing health service provision supporting self-management among type 2 diabetes patients in Health Region 2, Thailand.

Materials and Methods: A cross-sectional study was applied. Three hundred seventy case managers from Sub-district Health Promoting Hospitals participated. Data was collected using a researcher-developed questionnaire and analyzed through descriptive statistics and multiple linear regression analysis.

Results: Service provision for diabetes self-management was rated at a high level overall, with a mean of 3.82. Seven significant factors consisting of equipment support, data preparedness, provider skills, village health volunteer (VHV) participation, patient participation, service direction, and the nursing profession, respectively and jointly predicted 60.5% of the variance in service delivery effectiveness (adjusted $R^2=0.605$, $p<0.05$).

Conclusion: Effective diabetes self-management service models must integrate policy direction, resource provision, provider skill development, patient engagement, and community support through VHVs. Moving from provider-centered care to a collaborative approach to service provision can significantly enhance patient outcomes.

Keywords: Type 2 diabetes patients; Self-management support; Service provision; Primary health care

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The global burden of diabetes is rising steadily. According to the International Diabetes Federation (IDF) in 2024, there were 589 million people living with diabetes worldwide, representing a global prevalence of 11.1%. This number is projected to rise to 853 million by 2050, with an estimated prevalence of 13%, and diabetes accounts for 9.3% of global deaths⁽¹⁾. In Thailand, the national prevalence of diabetes has also been increasing annually. In the past three years, 2022 to 2024, the national prevalence

rates were 7.34%, 7.70%, and 8.08%, respectively. In 2024, the highest prevalence was reported in Health Region 2 at 9.49%. This region comprises the lower-northern provinces of Tak, Phitsanulok, Phetchabun, Sukhothai, and Uttaradit. Moreover, 66.23% to 70.78% of patients in this region failed to meet blood glucose control targets between 2022 and 2024⁽²⁾. Consequently, nearly two-thirds of patients were at risk of developing chronic complications, contributing to an estimated annual national cost of 144.1 billion Baht, or 22,652 Baht per person per year⁽¹⁾.

Diabetes service delivery plays a crucial role in helping patients manage their blood sugar levels. However, the effectiveness of services designed to support patient self-management remains inadequate. This is evidenced by findings from the NCD Clinic Plus Program self-assessments conducted in 2021 and 2023, which showed that the lowest-scoring component was related to self-management support service provision systems⁽³⁾. These results highlight

Correspondence to:

Wanaratwichit C.
Faculty of Public Health, Naresuan University, 99 Moo 9, Phitsanulok
65000, Thailand.
Phone: +66-88-2813539, Fax: +66-55-967333
Email: Civilaizw@nu.ac.th

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the operational barriers faced by healthcare providers in supporting diabetes self-management, suggesting a need for targeted service development. A study in Health Region 3 identified a strong demand among NCD Clinic Plus staff for improving self-management support services⁽⁴⁾.

A review of previous research found that most studies focus on patients, patient self-management, and factors related to reducing blood sugar levels and health behaviors of diabetic patients. Very few studies focus on service providers, especially regarding the organization of services for diabetic patients to enable self-management to reduce blood sugar levels. However, factors related to service provision to enable diabetic patients to self-manage are found to be diverse, including service management factors such as financial, workforce, and equipment support⁽⁵⁾, and building cooperation with networks⁽⁶⁾, service provider capability, and service characteristics to facilitate and motivate patient participation⁽⁷⁾, facilitate and empower community and local organizations to participation⁽⁸⁾. These factors often change according to the context of each area where patients cannot control their blood sugar levels.

From the above information, it is evident that the problem of blood sugar control in diabetic patients remains an issue, and the organization of health service provision for supporting diabetic patients in self-management to control blood sugar levels is still not as effective as it should be. Therefore, it is necessary to study the service provision problems and causal factors of service provision to support diabetic patients in self-management, especially in Health Region 2, where diabetes prevalence is increasing and only one-third of patients can control their blood sugar. This is to use the study results as information for developing more effective service models tailored to this region’s service system for diabetic patients to enable self-management. The present study aimed to examine the service provision for diabetes self-management support and identify the factors influencing service provision to support the self-management of the diabetes patients in Health Region 2, Thailand.

The conceptual framework

The conceptual framework of the present research applied the concept of a dynamic health system, focusing on systematically linking service management among healthcare units and related factors⁽⁹⁾. It also applied the 5 A’s Behavior Change Model, adapted for self-management support

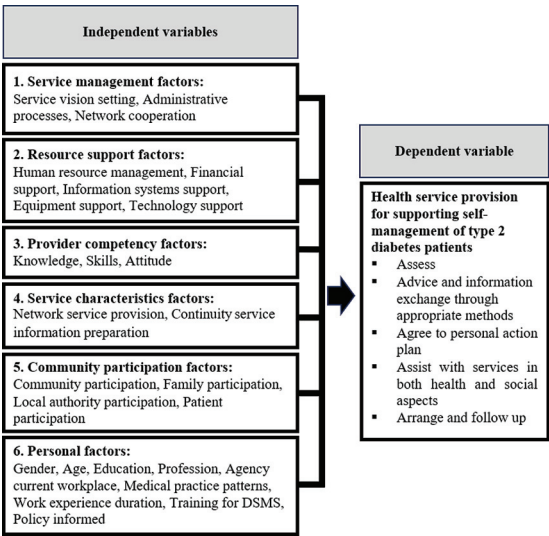


Figure 1. The conceptual framework.

service⁽¹⁰⁾, in conjunction with a review of relevant literature to study health service provision to support the self-management of type 2 diabetes patients and factors affecting it. The framework showed that there were six independent factors affecting service provision to support self-management of type 2 diabetes patients. They are composed of 1) service management factors, consisting of policy direction, managerial process, and network collaboration, 2) resource support factors, consisting of human resource management, financial support health information support, equipment support such as glucometer and strip, patient education media, and electronics technologies support, 3) provider competency factors, consisting of knowledge skills, and attitude, 4) service model characteristics, consisting of network service provision, continuity, and patient data pre-service preparation, 5) community participation factors, consisting of village health volunteer (VHV), family, local authorities, and patient participation, 6) provider demographic factors, consisting of gender, age, education level, professional, agency, doctor service pattern, service experience, training, and policy. The service provision, or the five A’s, as dependent factor is composed of 1) Assess, 2) Advice, 3) Agree to personal action plan, 4) Assist, and 5) Arrange and follow up that informed as in Figure 1.

Materials and Methods

Methods

The present study was a cross-sectional study conducted to examine factors influencing health

service provision for supporting the self-management of patients with type 2 diabetes in Health Region 2 between December 2024 and March 2025.

Population and samples

Six hundred seventy-five case managers in health service provision to support the self-management of the diabetes patients in Health Region 2 participated in the present study.

Samples: Case managers in health service provision to support the self-management of the diabetes patients in primary care units in Health Region 2. The sample size was calculated with the N4Studies Application⁽¹¹⁾ by setting the standard deviation statistic (SD 0.73)⁽⁴⁾ at the confidence interval of 95% and error of 0.05. The calculated sample size was 370.

A multi-stage random sampling method was used. First, the proportion of care units in each of the five provinces was determined. Second, the proportion of care units in each of districts in their own province was determined. Third, a simple random sampling was applied to select care units by district. Three hundred seventy samples were distributed among the five provinces with 67 in Tak, 86 in Phitsanulok, 84 in Phetchabun, 76 in Sukhothai, and 57 in Uttaradit.

Inclusion and exclusion criteria

The informants had worked on providing services to support the self-management of diabetes patients for more than 50% of their working time in the care units for one year or more. Informants who moved to work in other areas or withdrew from the study were excluded.

Research instrument

The questionnaire consisted of seven parts, as described below. The instrument for collecting data was a researcher-developed questionnaire designed based on the Dynamic Health System Framework (DHSF), which served as the overarching theoretical foundation. Parts 2 to 6 reflected the major components of the health system, which are service information (information systems), provider-related factors (health workforce), patient and community involvement (community and people-centered care), resources and equipment (medical products and technologies), and system and policy factors (governance and financing).

Part 1 was the general information about the informants (ten items). In this part, eight items were

in the multiple-choice format concerning gender, educational level, workplace, profession, affiliation, doctor's working pattern, duration of this service provision, training, and acknowledgement of service provision policy. The other two items were completed by filling in the blanks concerning age and number of years responsible for this service.

The independent variables in parts 2 to 6 were service management factors (11 items), resource support factors (15 items), and the service provider's competency in service provision to support self-management factors, which included three sub-parts. Those were knowledge factors in the true or false form of a knowledge test (15 items), skill factors (6 items), attitude factors (5 items), service characteristic factors (10 items), and community participation factors (13 items). All parts were based on 5-point Likert scale, except the knowledge test, which was in true or false format.

For the dependent variable, Part 7: health service provision, the 5 A's Behavior Change Model, which were Assess, Advise, Agree, Assist, and Arrange, was applied to capture how healthcare providers delivered for supporting self-management of diabetic patients.

For Parts 2 to 7, except for the knowledge test, the interpretation criteria were in 5 levels according to the concept of Fisher⁽¹²⁾, from 1 as strongly disagree to 5 as strongly agree. For the part provider's knowledge factors were classified on a five-level grading scale according to Bloom's taxonomy as follow⁽¹³⁾: very high at 4.20 to 5.00, high at 3.40 to 4.19, moderate at 2.60 to 3.39, low at 1.80 to 2.59, and very low at 1.00 to 1.79.

Instrument validation

Content validity was evaluated by five experts composed of four public health academics and one diabetes service specialist. Item-objective congruence (IOC) values ranged from 0.60 to 1.00, meeting the minimum acceptable standard of 0.60.

Reliability was assessed via a pilot test among 30 primary healthcare providers in Health Region 3. Cronbach's alpha was used for scaled items, with acceptable values above 0.70⁽¹⁴⁾. The knowledge section used the Kuder-Richardson Formula 20 (KR-20)⁽¹⁵⁾. Reliability coefficients for each section were 0.84, 0.88, 0.70, 0.88, 0.89, 0.87, 0.85, and 0.88, respectively, and overall, 0.83.

Data collection

After receiving approval from the Naresuan University Institutional Review Board, the researchers

Table 1. Characteristics of the informants in the study (n=370)

Personal characteristics	Sub-characteristics	Number	Percentage
Sex	Female	331	89.5
	Male	39	10.5
Age	Less than 30 years	94	25.4
	30 to 40 years	93	25.1
	41 to 50 years	78	21.1
	More than 50 years	105	28.4
Education level	Diploma level	3	0.8
	Bachelor's level	334	90.3
	Master's level and above	33	8.9
Workplace	Subdistrict health promotion hospital	356	96.2
	Primary care unit of the hospital	14	3.8
Affiliation	Ministry of Public Health	252	68.1
	Local Administrative Organization (LAO)	118	31.9
Profession	Nurse	305	82.4
	Public health technical officer and public health officer	65	17.6
Doctor's work	Doctor from a network hospital	298	80.5
	Regular doctor at the subdistrict health promotion hospital	16	4.3
	No doctor available	56	15.1
Duration of service to support self-management	0 to 5 years	182	49.1
	6 to 10 years	92	24.9
	More than 10 years	96	25
Training	Receive continuous training every year	119	32.1
	Receive training in some years	162	43.8
	Never receive training	89	24.1
Policy acknowledgement	Always	58	15.7
	Sometimes	236	63.8
	Never	76	20.5

requested permission from the provincial public health offices and the provincial administrative organizations in Health Region 2 in Phitsanulok, Sukhothai, Uttaradit, Tak, and Phetchabun provinces by giving an explanation about the objectives of the study, and a description of the questionnaire data collection method and prior to answering the questionnaires, all informants were informed and gave their consent. The questionnaires were examined for completeness before being analyzed statistically.

Data analysis

The IBM SPSS Statistics, version 20.0 (IBM Corp., Armonk, NY, USA) was used to determine the statistical significance at the 0.05 level. Descriptive statistics were used in the form of frequency, percentage, mean, and standard deviation to analyze the informants' data, while multiple linear regression analysis was used to analyze factors influencing service provision to support the self-management of the diabetes patients, and stepwise selection was used

to select variables.

Ethical approval

The present study was approved by the Human Research Ethics Committee of Naresuan University (COA No. 381/2024, IRB No. P2-0307/2567) on November 5, 2024. This confirmed that the study followed international ethical standards and was approved by a reliable institutional review board (IRB). This type of ethical approval ensured that the study considered the rights, confidentiality, and safety of human participants, allowing it to be published in academic journals.

Results

The characteristic of informants were females at 89.5% at the age of over 50 years for 28.4%. Their professions were nurses in 82.4% and graduated at the bachelor's level in 90.3%. Their workplaces were mostly subdistrict health promotion hospitals in 96.2%, affiliated under the Ministry of Public

Health in 68.1%. Most doctors were assigned from network hospitals at 80.5%. Most informants had worked in their roles for 0 to 5 years in 49.1%. Meanwhile, officers receive training annually in 32.1%. Regarding policy, sometimes acknowledged the policy was answered in 63.8%. The results are presented in Table 1.

The analysis of the independent variables, service management was at a high level, with a mean of 3.80, and the highest mean at the sub-variable of network cooperation. The resource support was at a moderate level with a mean of 3.26, and the highest mean on the sub-variable of data support and the lowest mean on the sub-variable of financial support. Regarding the service provider’s competency, which included three sub-variables, knowledge of the service provider was at a very high level with a mean of 4.38, skill of the service provider was at a high level with a mean of 3.60, and attitude of the service provider was at a very high level with a mean of 4.26. Service characteristics were at the high level with a mean of 3.95 and the highest mean at the sub-variable network service between the hospital and the community. Finally, community participation was at a high level with a mean of 3.72, thus, important role of family and health volunteers. The analysis of the dependent variables found that the service provision to support the self-management of the type 2 diabetes patients had an overall mean of 3.82. The sub-variable of inquiry and assessment (Ask and Assess) had the highest mean of 3.88 whereas the sub-variables of assistance (Assist) and follow-up and plan modification (Arrange) had the lowest means of 3.53 and 3.52 respectively, as shown in Table 2.

The analysis found variables with statistically significant differences at 95% confidence level (p<0.05). All seven factors together predicted 60.5% of the service provision to support self-management for type 2 diabetes patients in health region 2 by stepwise method and no multicollinearity (VIF value=1.045 to 2.018). The factors with the highest predictive power in the top five ranks were equipment support, followed by service information preparation, service provider skills, health volunteer participation, and patient participation, respectively, as shown in Table 3.

The prediction equation can be written as follows: Service provision to support self-management for type 2 diabetes patients = -0.436 + 0.318 (Equipment support) + 0.233 (Service information preparation) + 0.224 (Service provider skills) + 0.217 (Health volunteer participation) + 0.147 (Patient

Table 2. Mean, standard deviation, and interpretation of independent and dependent variables

Independent variables	Mean	SD	Interpretation
1. Service management	3.80	0.736	High
1.1 Service direction setting	3.81	0.752	High
1.2 Management process	3.57	0.818	High
1.3 Network cooperation	3.85	0.803	High
2. Resource support	3.26	0.806	Moderate
2.1 Human resource support	3.14	0.864	Moderate
2.2 Financial support	2.76	0.863	Moderate
2.3 Data system support	3.68	0.759	High
2.4 Equipment support	3.41	0.889	High
2.5 Technology support	3.30	0.898	Moderate
3. Service provider’s competency			
3.1 Knowledge of practitioner	4.38	0.764	Very high
3.2 Skill of practitioner	3.60	0.688	High
3.3 Attitude of practitioner	4.26	0.717	Very high
4. Service characteristics	3.95	0.689	High
4.1 Network service	3.96	0.780	High
4.2 Continuous service	3.75	0.732	High
4.3 Preparation of service data	3.89	0.697	High
5. Participation	3.72	0.651	High
5.1 Participation of health volunteer	3.76	0.771	High
5.2 Participation of family	3.80	0.742	High
5.3 Participation of local administrative organization	3.48	0.810	High
5.4 Participation of patient	3.53	0.659	High
Dependent variables			
Health service provision for support self-management overall	3.82	0.717	High
• Inquiry and assessment (Ask and Assess)	3.88	0.671	High
• Advice (Advice)	3.86	0.751	High
• Agreement to arrange goals and plans (Agree)	3.81	0.697	High
• Assistance (Assist)	3.53	0.773	High
• Follow-up and plan modification (Arrange)	3.52	0.773	High

SD=standard deviation

participation) + 0.110 (Service direction setting) + 0.087 (Nursing profession)

Discussion

Based on the seven factors identified as influencing the effectiveness of diabetes self-management support services in Health Region 2, equipment support, service information preparation, service provider skills, health volunteer participation, patient participation, service direction setting, and nursing profession, the findings can be synthesized into four key discussion areas. These results underscore the need for integrated service delivery

Table 3. Multiple linear regression analysis of factors predicting health service provision for support self-management of type 2 diabetes patients

Prediction variables	Standardized coefficients (beta)	Unstandardized coefficients (B)	SE of B	t	p-value
Equipment support	0.318	0.111	0.015	7.515	<0.001
Service information preparation	0.233	0.068	0.013	5.016	<0.001
Service provider skills	0.224	0.230	0.042	5.531	<0.001
Health volunteer participation	0.217	0.081	0.016	4.910	<0.001
Patient participation	0.147	0.047	0.015	3.168	0.002
Service direction setting	0.110	0.037	0.014	2.637	0.009
Nursing profession	0.087	0.121	0.047	2.600	0.010

Constant= -0.436, Adjusted R²=0.605, F=57.573, p<0.05

that connects healthcare providers with community resources, thereby supporting sustained behavioral change in the management of chronic diseases. Transitioning from a provider-centered model to a collaborative, patient- and community-engaged approach to service provision can significantly enhance patient outcomes.

1. Equipment readiness and systemic resources support: Adequate equipment, particularly blood glucose meters, test strips, and digital monitoring tools enable proactive self-monitoring in home and community settings, empowering patients to make timely behavioral adjustments and reinforcing confidence in primary care engagement. The study results are consistent with the study of Xiong et al.⁽⁵⁾ and Buranasompop⁽¹⁶⁾. Within the Expanded Chronic Care Model (ECCM), this reflects the clinical information systems and self-management support components, while in the 5 A's Model, it aligns with Assist and Arrange, ensuring both access to tools and structured follow-up. Although evidence suggests behavior modification can occur without home monitoring equipment through counselling and tele-nursing from the research findings of Choovaree & Ruangaram⁽¹⁷⁾, the availability of equipment enhances scalability and sustainability, particularly in resource-limited or rural contexts where affordability and accessibility remain critical. A systemic policy approach should therefore prioritize secured funding streams for procurement and equitable distribution of self-monitoring devices, supported by regional procurement mechanisms that guarantee timely availability and affordability. Financial policies should also consider cost-sharing mechanisms or subsidies for vulnerable populations to reduce economic barriers and promote adherence.

2. Information systems and provider competencies: Comprehensive, integrated patient data covering medical history, lifestyle, and

self-care behaviors supports accurate Assess, appropriate Advice, and effective Arrange functions. Shared electronic health records (EHRs) facilitate multidisciplinary coordination and continuity of care together, consistent with ECCM's clinical information systems and delivery system design⁽¹⁸⁻²⁰⁾. Equally important are provider competencies in motivational interviewing, collaborative goal setting, and empathetic communication. These skills are central to advising and agreeing on achievable shared care plans and are especially well-developed among nurse practitioners (NP), who combine clinical expertise with empowering counselling capabilities, according to the 5 A's behavior modification model⁽¹⁰⁾. Additionally, the study of Timmermans et al. suggested an innovative blended learning approach program, adaptability to professionals and long-term impact evaluation⁽²¹⁾. To strengthen these capacities systematically, regional workforce development strategies should include continuous competency-based training for all professional roles including physicians, nurses, and VHV's with incentives for skill advancement. Such strategies require policy-backed funding allocations for human resource development, including structured curricula for self-management support, e-learning platforms, and on-site coaching. This policy alignment ensures that the quality of counselling and care remain consistent across regions and reduces disparities in service provision.

3. Patient-community and system engagement: Sustainable self-management requires active patient participation in goal setting, plan implementation, and review that is consistent with the study of Arreeaour & Chomnirat who found that the process of supporting patients' self-management required the participation of patients in determining the situation, planning, following the plan, improving the plan, and reflecting on the results together, before

being able to modify the related behavior. The study results reflected that the service provision required patients to be a part of the service provision process, starting from setting goals to implementation⁽²²⁾. One-way delivery of service is insufficient. Instead, collaborative processes ensure behavioral plans are both relevant and feasible. VHV play a critical role as community intermediaries, delivering culturally relevant education, assisting with follow-up, and ensuring continuity of care beyond the clinic. This reflects ECCM's community resources and linkages domain and operationalizes the Assist and Arrange steps that are consistent with the study of Kanhachin & Limtrakul who found that patients who participated in developing personal skills with home-visit planning and monitoring by the health team together with VHV have better self-care behaviors and better control of their accumulated blood sugar levels⁽²³⁾. At the systemic level, clear policy direction and intersectoral coordination underpin these linkages. National initiatives, such as the Ministry of Public Health's NCD prevention policy, demonstrate the effectiveness of top-down frameworks in standardizing services and mobilizing VHV in proactive community education⁽²⁴⁾. However, these efforts must be supported by sustainable financing architecture. These include dedicated budgets for community engagement activities, incentive-based support for VHV, and performance-linked financing for local health-promoting hospitals to foster accountability and innovation. Embedding financing mechanisms within the National Health Security Fund and community health funds ensure continuity and avoid fragmentation.

Integrative and systemic perspective

4. Service direction setting: Effective service direction requires policy-driven frameworks, strategic resource allocation, and coordinated system leadership to ensure the long-term sustainability of diabetes self-management support. Synthesizing the findings highlights the interconnectedness of equipment availability, robust information systems, skilled providers, engaged patients, active community partners, and coordinated system leadership. Moving beyond the service level, a systemic approach guided by policy frameworks, resource allocation, and financial mechanisms is critical for long-term sustainability. This finding is consistent with the study of Sirimai & Chomnirat, who found that developing services to support self-management means administrators must establish

management policies with systematic links from planning, implementation, evaluation, and feedback for continuous development⁽²⁵⁾ according to the concept of ECCM⁽²⁰⁾, while the 5 A's Model offers a patient-centered process for operationalizing these connections. Embedding these processes within a policy-driven ecosystem ensures that diabetes self-management support extends beyond the clinical setting, embedding sustainable health behaviors within patients' daily lives. This approach requires alignment of regional strategies, implementation plans, and financial sustainability mechanisms, ensuring that resources whether equipment, human capacity, or funding are consistently available to support both individual and community-level interventions.

Synthesizing all four domains highlights the interconnectedness of equipment availability, robust information systems, skilled providers, engaged patients, active community partners, and coordinated system leadership. Long-term sustainability depends on a systemic, policy-driven approach, integrating governance, resource allocation, financial mechanisms, and workforce development. Aligning regional strategies, implementation plans, and financial sustainability ensures that resources are consistently available to support both individual- and community-level interventions, embedding sustainable health behaviors and improving patient outcomes in chronic disease management.

Limitation and recommendation

The present study has limitations. First, the cross-sectional design limits causal inference and captures only a single point in time, not changes or trends essential for understanding behavior change and service adaptation. Second, the study did not collect data from diabetic patients. Third, findings are specific to Health Region 2 and may not generalize to regions with different systems, resources, or demographics. Variations in policy, workforce, and patient profiles could affect applicability. Lastly, local contextual factors such as organizational culture and community dynamics, which may have influenced results and should be explored in future qualitative or mixed-method research.

Conclusion

The present study reported the factors influencing the health service provision that support the self-management of diabetes patients in Health Region 2. Through descriptive statistics and multiple regression

analysis, seven significant factors were found to influence on service provision, 1) equipment support, 2) service information preparation, 3) service provider skills, 4) nursing profession, 5) patient participation, 6) VHV participation, and 7) service direction setting. However, these factors collectively underscore the complexity and interconnectedness of diabetes care in the primary health care system. These findings highlight the necessity of integrated service delivery linking healthcare providers and community resources. A shift from provider-centered care to a collaborative, patient- and community-engaged approach can enhance long-term behavioral change and improve patient outcomes in chronic disease management.

Practical implications of this study are multi-level with 1) the service level that are the healthcare teams, especially nurses and VHVs who must be equipped with the tools, training, and data systems necessary to engage patients in collaborative goal-setting and behavior change, 2) the community level that need to involve patients and VHVs as co-managers of care to strengthen continuity and relevance of services beyond clinical settings, and 3) the policy level that must have a clear leadership and aligned direction, which are required to integrate efforts across sectors, support capacity building, and institutionalize self-management support as a routine part of chronic disease care.

What is already known about this topic?

It is well known that effective diabetes care requires continuous treatment in healthcare facilities, ensuring that patients receive continuous medication and eat appropriately so they can live with diabetes. However, good quality of life for diabetes patients should not involve complications and should enable them to control their blood sugar levels. That is, diabetes patients should be able to manage themselves to have good health behaviors. Therefore, service provision to support the self-management of diabetes patients and factors related to service provision should be studied further and developed.

What does this study add?

This study found that the development of service provision to support the self-management of diabetes patients requires the integration of interrelated factors covering the entire system, from the policies that affect resource allocation, such as necessary equipment and medicines, to the competence and skills of service providers, both at the individual

and team levels. In addition, the study found that data-sharing by health teams within the service units and the linkage with the community through VHVs to patients can facilitate the adjustment of service models to suit each patient and can respond appropriately to different contexts in each area.

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Conflicts of interest

The authors reported no potential conflict of interest.

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