Enhancing Adherence to Home-Based Diabetes Care: A Quality Control Circle Intervention Study

Caixia Yang, Mingyan Yang, Liqing Zhang, Yanzhi Yi*
Southern University of Science and Technology Hospital, Shenzhen, Guangdong, China
**Corresponding Author.*

Abstract: To evaluate the impact of Quality Control Circle (QCC) in raising the completion rate of home-based care services for diabetic patients, and to provide standardized home-based care for this population.A total of 51 diabetic patients discharged from our hospital from January to December 2020 were enrolled. A multidisciplinary home-based care service management model for diabetic patients was established using QCC methodology, and standardized home-based care management was implemented.The QCC intervention significantly increased home-based care completion rates from 51.37% (94/183) at baseline to 95.08% (174/183) post-intervention (χ^2=35.05, P<0.001).Secondary outcomes revealed significant reductions in mean length of stay (6.33±0.31vs 5.20±0.13 days, t=48.23, P<0.05) and average hospitalization costs (CNY 6535.03±203.20 vs CNY 5332.79±149.44, t=17.60, P<0.05).The QCC activities significantly improved care standardization by establishing a multidisciplinary home-based care model for diabetics, which suggests its potential for broader clinical implementation.

Keywords: Quality Control Circle; Home-Based Care; Diabetes Mellitus; Completion Rate

1. Introduction

Diabetes Mellitus (DM), is characterized by a long disease course, multiple complications, and substantial utilization of healthcare resources, necessitating ongoing treatment and care. The hospital-centered healthcare model has proven inadequate in addressing the long-term and continuous health management needs of diabetic patients [1]. Our hospital currently provides continuity of care services for diabetic patients through telephone follow-up and WeChat group communication. However, due to the decentralized implementation approaches, the lack of standardized intervention protocols across different continuity-of-care models, and weak systematic management, diabetic patients often fail to receive comprehensive home-based care services.

To enhance home-based care delivery, leverage the leadership position of tertiary general hospitals within regional healthcare networks, and establish a novel medical service system centered on "Internet + nursing services," our hospital has initiated a quality improvement project titled "Enhancing the Completion Rate of home-based Care Services for Diabetic Patients." This effort seeks to explore and standardize home-based care service models, refine service workflows and standards, promote glycemic control, and reduce hospitalization duration. Furthermore, it holds significant implications for standardizing home-based care management for hospitalized diabetic patients, comprehensively improving the knowledge, attitudes, and practices (KAP) of both patients and carers regarding diabetes, alleviating familial psychological and economic burdens, decreasing medical resource utilization, and ultimately enhancing patients' quality of life.

2. Materials and Methods

2.1 Clinical Data

This study adopted a self-controlled pre-post design and enrolled patients who received diabetic home-based nursing care after discharge from the Department of Endocrinology between January 2020 and December 2020. Inclusion criteria: 1) Confirmed diabetes diagnosis[2]; 2) home-based care service demand items matching Guangdong Province's "Internet + Nursing Services" catalog; 3) Signed informed consent from patients/family; 4) Full participation in home-based care management with complete data. Exclusion criteria: 1) Hospitalized patients; 2) home-based Care demands beyond catalog scope ; 3) Missing critical clinical data. A total of 51 eligible patients were ultimately included in the analysis. The cohort consisted of 20 males (39.2%) and 31 females (60.8%), with an age range of 45-91 years and a median age of 68.3 years.

2.2 Methods

2.2.1 Establishment of a Multidisciplinary QCC Team

Under the leadership of the Nursing Department, a multidisciplinary QCC team was established with nine healthcare professionals, including endocrinologists, diabetes specialist nurses, Continuing care team, Patient relationship Department and Publicity Section. A standardized competency assessment revealed an overall QCC competency coefficient of 74.4% for the team.

2.2.2 Identification of Quality Improvement Theme

QQC meeting was held by using the brainstorming method, 12 common clinical care-related issues were initially identified. Following generalization and summarization, five core problems were selected through the multi-voting method. The quality improvement theme was ultimately determined as "Enhancing the Completeness Rate of Home-based Care Services for Diabetic Patients" based on significance, feasibility, and team competency. Effectiveness measurement indicators: DM patients home-based Care Services Completion Rate = [Σ(home-based care service items delivered) / Σ(home-based care service items required)] × 100%.

2.2.3 Activity Plan Formulation

After the research theme was confirmed, the team leader organized meetings with members to formulate a structured activity plan. Utilizing the 5W+2H analytical framework with the problem-solving project methodology, create a Gantt chart, clarify the division of labor, and develop the implementation plan.

2.2.4 Current situation

The existing continuity of care for DM patients in our institution faces three challenges: (1) Diabetics necessitate long-term treatment and care, insufficient remote services fail to address patients' true needs; (2) For issues that require in-person consultations for specialized treatment, there is heightened difficulty in accessing healthcare; (3) the administration of discharge follow-up is deficient in information technology and intelligence.

Current situation indicates that our hospital is offering discharge follow-up continuity of care services for discharged DM patients mainly through telephone and WeChat. The home-based care service required involves eight items: (1)Dietary guidance, (2)Exercise guidance, (3)Oral medication guidance, (4)Capillary blood glucose monitoring, (5)Continuous glucose monitoring, (6)Insulin injections, (7)Retained/replaced insulin pump catheter care, and (8)Diabetic foot care.

A self-designed questionnaire was administered to 51 DM patients in internal/surgical wards and specialty clinics to evaluate their home-based care service delivered. The research revealed 183 service delivered, resulting in a completion rate of 51.4%.

2.2.5 Target Value Setting

The target value was calculated using the formula: Target Value = State Value + improvement value = DM patients home-based Care Services Completion Rate + (Completion Rate* Improvement focus * Team's Improvement Capability) ＝ 51.4%+(51.4%×80.9%×80%) ＝ 84.67%. The target value was 84.67%.

2.2.6 Analysis and Identify the Root Cause

To address the existing issues, the circle members performed a cause analysis through the brainstorming approach across five dimensions: human, machine, material, environment, and method variables. A fish-bone diagram was created to identify essential factors. A checklist was developed to collect data via face-to-face interviews with 60 randomly selected nurses from 12 clinical wards, along with document reviews from relevant departments. Drawing the Plato chart based on the findings resulted in five root causes: (1) absence of emergency response protocols, (2) deficiency of relevant system and grant schemes, (3) lack of home visit procedures and norms, (4) insufficient training programs, (5) lack of expert resource databases.

2.2.7 Countermeasure formulation and implementation

Eight circle members brainstormed countermeasures according to feasibility, economy, and effectiveness, in which the evaluation items scored 5 points for important, 3 points for general, and 1 point for secondary. Following the 80/20 principle, strategies achieving a total score ≥96 were selected. Four main countermeasures were ultimately identified: 1) establishing a reasonable mechanism to standardize the home-based care service model; 2) improving the process and standards of home-based care service; 3) strengthening foundational knowledge and specialized service training while expanding promotion efforts; 4) innovating the information resource platform to smooth the channels of home-based care reservation and service.

Establishing a reasonable mechanism to standardize the home-based care service model

By reviewing national documents, conducting investigations in tertiary hospitals, and consulting experts, circle members developed an

implementation plan for "Internet + Nursing Services" and established qualification criteria for home-based nursing practitioners along with review procedures. Meanwhile, a list of home visit personnel was created, and home-based care teams were structured based on clinical specialties and service categories, while staff evaluations been set up.

Improving the process and standards of home-based care service

A senior clinical nurse supervisor was assigned to oversee home care management and to develop the home visit service procedure based on clinical realities. A group discussion was held to clarify the following documents: home care service assessment form, home care service registration form, service agreement, informed consent, and home visit record while developing the home visit service flow according to the clinical service requirements in conjunction with the actual situation. Develop an emergency response plan for the safety of home-based care services, an home visit staff allocation initiative, and an home visit performance grant program.

Strengthening foundational knowledge and specialized service training while expanding promotion efforts

To enhance the awareness among nurses and patients regarding home-based care services, the Nursing Department developed standardized training materials and disseminated them to all departments for educational purposes. Specialized training for home-based care service providers was conducted in phases, culminating in the completion of pre-service training and assessment for 198 practitioners. Each department carries out training and evaluation based on the specific qualities of its specialty and service offerings. The Nursing Department's annual plan included regular training for home-based care services, while specialty service project training was incorporated into the daily instruction of the departments. Add home service promotional strategies into discharge cards following communication with the Patient relationship Department. Gather representative cases, compose press releases, and consult with the Publicity Section to ascertain the publicity strategies and content.

Innovating the information resource platform to smooth the channels of home-based care reservation and service

The hospital is asking for bids from qualified and experienced companies to develop a home care application that will establish reservation processes and charging standards for home care services. The app needs to have functionalities for service project listings, pricing announcements, fee notifications, payment processing, refunds, location, and a one-touch alarm feature. Simultaneously, it activates the home care reservation line on the hospital's public platform.

Data analysis

Data analysis was performed using SPSS25.0, a t-test was used for quantitative data, while a chi-square test was applied for categorical data, with $P<0.05$ being statistically significant.

3. Results

3.1 Changes in Key Indicators and Outcome Measures Before and After QCC Implementation

A comparative analysis of the requirements and completion of home-based care service was conducted on 51 patients and their carers before and after the QCC intervention. Post-QCC implementation, significant improvements were observed in the completion rates of five items: capillary blood glucose monitoring, continuous glucose monitoring,insulin injection, Retained/replaced insulin pump catheter care, and diabetic foot care ($P < 0.001$). The QCC achieved a target attainment rate of 130.9% with an improvement magnitude of 84.8% (Table 1).

Table 1. Comparison of Home-Based Care Service Completion Rates in DM Patients

	Service Item	Dietary Guidance	Exercise Guidance	Oral Medication Guidance	Capillary Blood Glucose Monitoring	Continuous Glucose Monitoring	Insulin Injection	Insulin Pump Catheter Care	Diabetic Foot Care	Total
Before	Required Episodes	29	36	29	23	13	37	6	10	183
	Completed Episodes	29	36	29	0	0	0	0	0	94
	Completion Rates(%)	100	100	100	0	0	0	0	0	51.37%
After	Required	29	36	29	23	13	37	6	10	183

	Episodes									
	Completed Episodes	29	36	29	22	10	34	5	9	174
	Completion Rates(%)	100	100	100	0.96	0.77	0.92	0.83	0.9	95.08%
	X^2	0.000	0.000	0.000	42.167	16.250	62.900	8.571	16.364	35.046
	P	1.000	1.000	1.000	0.000	0.000	0.000	0.003	0.000	0.000

3.2 Additional Benefits of QCC Activity: Reduced Hospital Stay and Costs in DM Patients

The mean length of stay for DM patients decreased by 1.13 days, from 6.33 days before decreased to 5.2 days post-QCC. Additionally, the average hospitalization cost diminished from 6,535.03 yuan to 5,332.79 yuan, reflecting a reduction of 1,202.24 yuan. These differences were statistically significant ($P<0.05$), as shown in Table 2.

Table 2. Comparison of Average Length of Hospital Stay and Costs in DM Patients

Items		Mean	SD	t	P value
Average Length of Hospital Stay	Before	6.33	±0.305	8.225	<0.05
	After	5.20	±0.130		
Average Hospital Costs	Before	6535.03	±203.20	17.60	<0.05
	After	5332.79	±149.44		

4. Discussion

The implementation of QCC activities can create a standardized management model for home-based care services tailored to diabetic patients post-hospital discharge, facilitating continuity of care. This project adhered to the ten steps of the QCC, analyzing the primary factors contributing to the low completion rate of diabetes home-based care services. Subsequently, improvement measures were proposed and executed to enhance the completion rate of these services. A comprehensive multidisciplinary home-based care service management approach for diabetes patients post-hospital discharge was developed and implemented to ensure continuity of care. Presently, home-based care services face several issues: lack of management file for diabetic patients post-hospital discharge or the in-completed management file; the dependence on healthcare personnel to actively track patients, resulting in an excessive workload for follow-up; and the deficiency of informational technologies. Consequently, it is essential to consistently enhance the quality of diabetic home-based care services and formulate service programs that address patient requirements. This project enhances the homogeneity and standardization of home care services for diabetes patients by standardizing the service model and refining the service processes and standards.

Analyze the hierarchy of the demand structure of home-based care services for diabetic patients through QCC project, and provide a foundation for the precise delivery of home-based care services for diabetic patients. The current demand structure for home-based care services for diabetes patients is ambiguous, with differences in dependence, expectation, and access of patients to demand for medical services. To improve the quality and efficiency of the supply system and render it more adaptable to fluctuations in demand structure, it is essential to accurately identify the differences in diabetic patients' requirements for home-based care services and to make precise efforts to gradually meet the diversified and differentiated demand of diabetic patients for medical care services.[2, 3] The implementation of QCC project reveals that the priorities of diabetic patients regarding home-based care services, ranked from highest to lowest, are: insulin injection, exercise guidance, dietary guidance, oral medication guidance, capillary blood glucose monitoring, continuous glucose monitoring, diabetic foot care, and Retained/replaced insulin pump catheter care, which provides a practical basis for the targeted enhancement of home-based care services for diabetic patients.

Increasing the complete rate of home-based care services can significantly decrease the mean length of stay and lower the average hospitalization expenses for diabetic patients. The increased length of stay will result in increased fees for medication, accommodation, and therapy, hence elevating the overall cost of hospitalization. Diabetes mellitus is a prevalent chronic disease, which is incurable, recurrent, and multi-complicated, leading to frequent hospitalizations and increased healthcare costs for sufferers. Improving the complete rate of home-based care can decrease the average length of stay and costs for diabetic patients, alleviating both economic and psychological burdens on patients[4]. This improvement also facilitates a higher turnover rate of hospital beds, optimizes bed utilization, and minimizes the wastage of medical resources.

Raising the complete rate of home-based care services can sustainably boost patient self-

management effectiveness. Consistent and efficient self-regulation of blood glucose is essential for effectively preventing diabetes-related complications and enhancing the prognosis of individuals with diabetes[5-7]. While the majority of diabetic patients can sustain a stable condition during hospitalization with adequate blood glucose management, post-discharge, their insufficient knowledge regarding diabetes prevention and treatment results in inadequate self-management capabilities and sub-optimal management outcomes. Improving the efficacy of patients' self-management can be achieved by enhancing the quality of home care services, refining home care programs, enabling patients to acquire self-management skills at home, and facilitating post-discharge transitional care through home care. This QCC project can significantly enhance patients' self-regulation of blood glucose by consistently increasing the complete rate of home-based care services, thereby ensuring that patients receive effective and scientifically home-based care, facilitating timely and convenient resolution of blood glucose management issues.

5. Conclusion

The QCC project revealed that a comprehensive and scientifically effective home care service can assist patients in developing systematic routines regarding medicine, monitoring, diet, and exercise. In the event of acute complications like hypoglycemia and ketoacidosis at home, efficient nursing measures can be implemented to prevent severe cardiovascular and cerebrovascular incidents. The QC circle project standardizes the systems and processes of home-based care services, employing scientific and practical methodologies for nursing quality management. It offers a convenient platform for home-based care services tailored to diabetes patients, enhancing the homogeneity and standardization of such services, which is worth promoting.

References

[1]Hyde E, Murphy B. Computerized clinical pathways (care plans): piloting a strategy to enhance quality patient care[J]. Clin Nurse Spec. 2012 Sep-Oct;26(5):277-82.

[2]Tian Mingxiang. Thinking on the construction and development of public hospitals under the background of supply-side reform[EB/OL]. [2020-09-20].

[3]Medical Administration Bureau of National Health Commission. Promoting geriatric nursing to support the construction of Healthy China[J]. Chinese Nursing Management, 2020,20(10):1497-1498.

[4]Du Huijie, Zheng Erwei. Analysis of factors affecting hospitalization costs of diabetes patients[J]. Chinese Medical Records, 2022,23(05):45-48.

[5]Chinese Diabetes Society. China type 2 diabetes prevention and treatment guidelines (2020 edition)[J]. Chinese Journal of Diabetes, 2021,04:315-409.

[6]Liu Lihong, Ding Jing, Yan Shuang, et al. The impact of follow-up nursing on self-care ability and health behavior of type 2 diabetes patients[J]. Journal of Nurse Education, 2015,30(14):1336-1338.

[7]Ran Liu, Biao Yuan and Zhibin Jiang. Mathematical model and exact algorithm for the home care worker scheduling and routing problem with lunch break requirements[J]. International Journal of Production Research, 2016, 55(2):558-575.

