Quality Survey of Standardized Diabetes Management in Primary Care: Postprint

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Abstract

Background The incidence of diabetes is increasing year by year. China has incorporated the management of type 2 diabetes as an important disease category into community basic health services; however, gaps remain in standardized grassroots diabetes management, particularly regarding quality and capacity. Objective To investigate the current status of diabetes management in Shanghai community health institutions and conduct a systematic quality evaluation, and to propose corresponding optimization recommendations for identified problems. Methods The survey was conducted in May 2022. Subjects included: (1) Community health service centers: all 249 community health service centers across Shanghai's 16 districts; (2) Community general practitioners: 3,875 practitioners selected via simple random sampling at a proportion of 50% of registered personnel. Self-designed questionnaires for medical institutions and general practitioners were administered to investigate the implementation status of diabetes management in community health service centers and the current state of standardized diagnosis, treatment, and management by community general practitioners. Results All Shanghai community health service centers can perform glycated hemoglobin testing; however, screening programs for diabetes complications are insufficient, with only 16.9% able to conduct nerve conduction velocity tests. While the variety of oral hypoglycemic agents is relatively complete, insulin types are limited, with only 7.6% equipped with new hypoglycemic drugs such as GLP-1 receptor agonists. Only 57.4% of centers have established diabetes specialty clinics. Community general practitioners demonstrate high recognition of standardized diabetes management and good mastery of grassroots diabetes management guidelines; however, their grasp of basic knowledge regarding diabetes therapeutic drugs is suboptimal, with accuracy rates of only 27.9% for oral hypoglycemic drug application knowledge and 29.0% for insulin application knowledge. When encountering newly diagnosed diabetic patients with high blood glucose levels or confirmed diabetic nephropathy, community

general practitioners are more inclined to directly refer patients to specialist departments in higher-level hospitals. Conclusion The infrastructure, equipment, and medications for diabetes management services in Shanghai community health service centers have basically met quality requirements; however, gaps exist in knowledge regarding drug usage. Measures including increasing screening and testing items for diabetes complications, expanding the variety of new hypoglycemic drugs and insulin types, strengthening the construction of diabetes specialty clinics, improving the diagnosis and treatment capabilities of general practitioners, and standardizing their clinical practices are needed to further enhance the quality of diabetes management and medical capacity in grassroots medical and health institutions.

Full Text

A Survey on the Quality of Diabetes Normative Management at Grassroots Level

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Abstract

Background: The incidence of diabetes has been increasing year by year, and China has incorporated the management of type 2 diabetes as an important disease category into community basic health services. However, there remains a gap in the standard management of diabetes at the grassroots level, particularly regarding quality and capacity. **Objective:** To understand the current status of diabetes management in Shanghai community health institutions and conduct a systematic quality evaluation, proposing corresponding optimization suggestions for existing problems. **Methods:** The survey was conducted in May 2022. The target population included: (1) Community health service centers: all 249 community health service centers across Shanghai's 16 administrative districts; and (2) Community general practitioners (GPs): 3,875 community GPs selected through simple random sampling at 50% of registered personnel. Self-designed

questionnaires for medical institutions and GPs were used to investigate the implementation of diabetes management in community health centers and the current status of standardized diagnosis, treatment, and management by community GPs. **Results:** All community health service centers in Shanghai could perform HbA1c testing, but screening programs for diabetes complications were insufficient—only 16.9% could conduct nerve conduction velocity tests. Oral hypoglycemic drug types were relatively complete, but insulin types were limited, with only 7.6% of centers equipped with new hypoglycemic drugs such as GLP-1 receptor agonists. Only 57.4% of community health service centers had established specialized diabetes clinics. Community GPs showed high recognition of standardized diabetes management and had good mastery of diabetes management guidelines, but their grasp of basic knowledge about diabetes treatment medications was poor, with correct rates of only 27.9% for oral hypoglycemic drug application knowledge and 29.0% for insulin application knowledge. When newly diagnosed diabetic patients presented with high blood glucose or when diabetic nephropathy was confirmed, community GPs were more inclined to directly refer patients to higher-level hospital specialists. **Conclusion:** The infrastructure, equipment, and drug conditions for diabetes management services in Shanghai community health service centers have basically met quality requirements. However, gaps exist in medication knowledge. It is necessary to further improve the quality and capacity of diabetes management in primary medical and health institutions by increasing examination and testing items related to diabetes complication screening, adding new types of hypoglycemic drugs and insulin, strengthening the construction of specialized diabetes clinics, and improving GPs' diagnosis and treatment levels to standardize their clinical behaviors.

Keywords: Diabetes mellitus; Disease management; Community health centers; General practitioners; Diabetes grassroots management quality

Introduction

In recent years, with population aging and lifestyle changes, the incidence of diabetes in China has shown an increasing trend, with prevalence soaring from 0.67% in 1980 to 10.4% in 2013. The number of adult diabetic patients reached 113.9 million, with prediabetic patients as high as 493.4 million [1]. If blood glucose levels in diabetic patients are poorly controlled long-term, besides obvious clinical symptoms, various complications will develop that seriously affect patients' quality of life [2]. Faced with this severe situation, China has included type 2 diabetes management in basic health services since 2009, with community general practitioner teams providing comprehensive, continuous, targeted, and proactive health management for diabetic patients [3]. The 2019 "Opinions of the State Council on Implementing the Healthy China Action" proposed implementing diabetes prevention and treatment action plans, incorporating standardized diabetes health management into the national health strategy [4]. The quality of grassroots diabetes management plays an important role in im-

plementing the "Healthy China" strategy. However, current grassroots diabetes management remains inadequate in terms of diagnostic and treatment standardization and complication follow-up [5], urgently requiring further improvement in disease management quality and capacity [6].

Based on the need for standardized diabetes management in grassroots medical and health institutions, this study investigated the current status of diabetes management in Shanghai community health service centers through questionnaires. The aim was to deeply understand the diagnosis and treatment capacity of grassroots medical institutions, the practices of community GPs in diabetes diagnosis and treatment, and the problems they face, and to propose corresponding optimization suggestions to further improve community diabetes management outcomes and promote the quality of community general practice clinical care.

Methods

Study Subjects

The survey was conducted in May 2022. The target population included: (1) Community health service centers: all 249 community health service centers across Shanghai's 16 administrative districts; and (2) Community general practitioners: 3,875 community GPs selected through simple random sampling at 50% of registered personnel. All participants signed informed consent forms. This study was approved by the Ethics Committee of Yangpu District Central Hospital (approval number: LL-2022-LW-015).

Questionnaire Design and Distribution

The research team designed the questionnaires based on the "Chinese Guidelines for the Prevention and Treatment of Type 2 Diabetes (2020)" [1], "National Guidelines for the Prevention and Management of Diabetes at the Grassroots Level (2022)" [7], and "Guidelines for the Diagnosis and Treatment of Type 2 Diabetes at the Grassroots Level (2019)" [8]. The questionnaires included two categories: (1) Medical institution questionnaire, mainly covering available diabetes diagnosis and examination items, diabetes treatment drug availability, diabetes management training implementation, specialized diabetes clinic establishment, and standardized diabetes management record creation; and (2) GP questionnaire, mainly covering primary measures for diabetes management by community GPs, GPs' awareness of standardized diabetes management and guideline familiarity, and difficulties in implementing standardized diabetes diagnosis and treatment and management. Question types included multiple-choice questions and standardized management awareness evaluation scales (scored out of 10 points, with 0 being completely unimportant and 10 being very important).

The survey questionnaires were distributed through the Shanghai General Practice Clinical Quality Control Center's quality control network. To ensure response rates, they were distributed point-to-point by quality control secretaries

and quality control liaisons from each community health service center. The questionnaires were distributed online via Wenjuanxing in two rounds. The first round distributed 249 questionnaires for grassroots medical institution diabetes management, with 249 valid questionnaires returned (100.00% response rate). The second round distributed 3,875 questionnaires for community GP standardized diabetes diagnosis and treatment and management, with 3,874 valid questionnaires returned (99.97% response rate). Results were exported in Excel format.

Statistical Analysis

Statistical analysis was performed using SPSS 25.0 software. Measurement data were described as ($\bar{x}\pm s$), and count data were described using relative numbers.

Results

Infrastructure and Resources

Examination and Testing Items: Community health service centers could all conduct HbA1c testing to evaluate blood glucose control in diabetic patients, but only 45.4% could conduct continuous glucose monitoring. While 75.9% could test urine protein/creatinine ratio or urine microalbumin, only 33.3% could test glomerular filtration rate, and merely 16.9% could conduct nerve conduction velocity tests .

Drug Availability: Community health service centers had relatively complete oral hypoglycemic drug types, covering most categories. However, insulin types were limited, with mealtime insulin availability at 72.7% and premixed insulin at 80.7%. Availability of new drugs was insufficient, with only 7.6% of community health service centers equipped with glucagon-like peptide-1 (GLP-1) receptor agonists .

Training Implementation: Over 90.0% of diabetes management training in community health service centers was conducted through in-house lectures, academic conferences, or training courses. About 80.0% required doctors to self-study diabetes guidelines, while few had opportunities for advanced training at higher-level hospitals or participating in diabetes teaching clinics at superior hospitals .

Specialized Clinics and Records: Only 57.4% of community health service centers had established specialized diabetes clinics, while 77.1% had created standardized diabetes management records.

GP Practices and Knowledge

Management Measures: When newly diagnosed diabetic patients presented with HbA1c $\geq$ 9.0% or fasting blood glucose $\geq$ 11.1 mmol/L, or when previously managed diabetic patients showed these levels, community GPs, besides

providing lifestyle interventions and recommending insulin or oral hypoglycemic treatment, were more inclined (62.3%) to directly refer patients to higher-level hospital specialists . When diabetic nephropathy was diagnosed, besides discontinuing nephrotoxic drugs, strictly controlling underlying diseases, and adjusting hypoglycemic regimens, 56.6% of GPs preferred direct referral to higher-level hospital specialists . Over 90.0% of community GPs provided health education on diet, exercise, and other aspects to diabetic patients .

Awareness and Guideline Knowledge: The vast majority of community GPs considered diabetes standardized management very important, with an average score of (9.38$\pm$1.18) points in this survey. They also considered lifestyle guidance, comprehensive blood glucose management, and diabetes complication screening very important for type 2 diabetes treatment, with average scores basically all exceeding 9 points . Community GPs had good mastery of diabetes identification, diagnosis, and referral knowledge, with a correct rate of 91.1%. However, their grasp of basic knowledge about diabetes treatment medications was poor, with correct rates below 30%, and their knowledge of diabetes complication screening was also unsatisfactory, with a correct rate of only 49.3% .

Challenges in Practice: This study investigated difficulties faced by community doctors in diabetes diagnosis and treatment through self-assessment. 71.0% of community GPs considered insufficient knowledge of new diabetes medications as their primary difficulty. In actual diabetes patient management, besides patient compliance issues, community GPs identified insufficient examination and testing equipment and incomplete drug availability as major challenges .

Discussion

Infrastructure Quality

In medical quality management, from an institutional perspective, equipping necessary diagnostic equipment, drugs, and space, and conducting diagnostic capacity training are all fundamental quality management elements [10]. According to this survey, Shanghai community health service centers have basically met quality requirements for infrastructure, equipment, and drugs for diabetes management services, which aligns with Sun et al.'s findings [11], indicating that community health service centers have established the basic conditions for implementing standardized diabetes management.

However, community health service centers still lack sufficient implementation of diabetes complication detection programs, particularly necessary tests for screening kidney, retinal, and nervous system complications such as glomerular filtration rate, fundus photography, and visual conduction. This is similar to Li et al.'s survey on diabetes complication screening in Nanjing's grassroots medical service centers [12], suggesting that current community health service centers cannot meet the needs for diabetes complication screening. Moreover,

the limited types of insulin available at community health service centers may contribute to GPs' insufficient experience with insulin use and their tendency to refer patients to higher-level hospitals when insulin is needed. This is consistent with Xiang et al.'s analysis of hypoglycemic drug use in a Shanghai community health service center, where premixed insulin accounted for 97% of total annual insulin consumption [13]. Additionally, although Li et al. noted that new hypoglycemic drug use is not restricted by hospital level [14], only a few community health service centers are equipped with new hypoglycemic drugs like GLP-1 receptor agonists, objectively preventing diabetic patients from conveniently accessing new hypoglycemic medications.

Furthermore, training methods provided by community health service centers are relatively singular, with few opportunities for advanced training at higher-level hospitals, reducing GPs' access to professional clinical guidance and limiting improvement in clinical capabilities [15]. Although 77.1% of community health service centers have established standardized diabetes management records, excessive copying and pasting in medical records results in low intrinsic quality [16]. Currently, 57.4% of community health service centers have established specialized diabetes clinics, which requires further strengthening to better guide patients in blood glucose control and improve self-management capacity [17].

GP Practices and Screening

Community GPs are the core of standardized diabetes management at the grassroots level, and their professional technical level and diagnostic behaviors directly affect patients' condition and complication control outcomes. Following the latest guidelines for comprehensive and standardized diabetes management is key to implementing grassroots diabetes management. The "Chinese Guidelines for the Prevention and Treatment of Type 2 Diabetes (2020)" [1] states that scientific and reasonable treatment for type 2 diabetes is comprehensive, including blood glucose reduction, lipid regulation, weight control, and lifestyle improvement. This survey shows that community GPs can provide lifestyle guidance, hypoglycemic or insulin treatment, and referral to endocrine specialists, demonstrating their awareness of standardized diabetes patient management.

The "National Guidelines for the Prevention and Management of Diabetes at the Grassroots Level (2022)" [7] states that type 2 diabetes patients should undergo complication screening at least once a year after diagnosis. However, statistics show that only 54% of diabetic patients in large municipal central hospitals received fundus examinations, and only 36% received nerve and limb complication examinations, with even lower proportions in grassroots hospitals [18], similar to this survey's results. Moreover, community GPs' poor mastery of diabetes complication screening knowledge may contribute to low screening rates. Diabetic nephropathy patients require comprehensive management including lifestyle intervention, risk management, and drug therapy [19]. This survey shows that 56.6% of community GPs prefer direct referral to higher-level

hospital specialists for diabetic nephropathy patients, possibly due to insufficient specialized knowledge about diabetic nephropathy treatment. Yang et al.'s study also showed that Shanghai community GPs had an overall correct rate of about 60% in answering diabetic nephropathy-related knowledge, with only 35.5% correct in management-related knowledge [20], indicating community GPs' lack of effective management capabilities for diabetic nephropathy patients.

Knowledge Gaps

This survey demonstrates that GPs have good mastery of standardized diabetes diagnosis and treatment knowledge with a correct rate of 91.1%, but poor mastery of oral hypoglycemic drug and insulin-related knowledge with correct rates of only 27.9% and 29.0%, respectively. Jia et al. reported similar findings, with 72% of community doctors having insufficient knowledge of diabetes treatment drugs [21]. This appears to be a common issue among community GPs, possibly because community health services have been developing toward general practice, with community GPs focusing more on health education and lifestyle guidance, while relatively weakening specialized functions and lacking specialized knowledge for diabetes diagnosis and treatment compared with higher-level hospitals [22].

Challenges and Improvement Strategies

Chronic disease management quality is influenced by multiple factors including medical institutions, doctor knowledge, and behaviors, requiring comprehensive analysis and accurate identification to formulate effective improvement strategies. Based on this study's results, key strategies to improve diabetes management quality in grassroots medical and health service centers include: First, continuously improving basic facility and equipment construction, increasing examination and testing items for diabetes complication screening, and adding new types of hypoglycemic drugs and insulin [24]; Second, focusing on improving community GPs' diabetes management knowledge, especially their skills in managing diabetes complications, through multi-channel and multi-level capacity training, such as increasing online platform training in fragmented ways, selecting key personnel for advanced training at higher-level hospitals, and participating in diabetes teaching clinics to increase learning exchange opportunities, thereby improving GPs' diagnosis and treatment levels and standardizing their clinical behaviors [25]; Third, strengthening the construction of specialized diabetes clinics to provide continuous and refined management for diabetic patients, and through individualized and targeted health education, improving patients' health literacy, changing unhealthy lifestyles, and better improving patient prognosis and quality of life [26].

This study's limitations mainly involve questionnaire design, as we only investigated the current community diabetes management status without addressing community management outcomes for diabetic patients. Additionally, commu-

nity GPs might not express their true situations when filling out questionnaires due to various reasons. In subsequent studies, our research team will strive to improve these aspects.

Conclusion

Shanghai community health service centers have initially established a basic support system for standardized diabetes management, with hardware facilities, basic medical equipment, and routine drug reserves basically meeting service quality standards, providing fundamental support for diabetes management. However, problems remain, including incomplete complication screening program coverage, insufficient availability of new hypoglycemic drugs, inadequate professional knowledge among GPs, and lagging construction of specialized diabetes clinics. Systematic improvement of comprehensive diabetes management capacity at the grassroots level can be achieved through increasing diabetes complication screening items to improve early identification systems, dynamically adjusting grassroots drug catalogs to include new hypoglycemic drugs, conducting specialized training to improve community GPs' diagnosis and treatment capabilities through expert teaching and case discussions, and strengthening community specialized diabetes clinic construction.

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Note: Figure translations are in progress. See original paper for figures.