

Exploration of Chronic Disease Management Models in Private Secondary General Hospitals (Postprint)

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Abstract

Chronic non-communicable diseases have become the primary factor endangering human health. In 2016, the “Healthy China 2030” Planning Outline first proposed comprehensive prevention and control of chronic diseases. In recent years, the domestic general practitioner workforce has grown increasingly robust, playing an important role as health gatekeepers in community residents’ medical care and chronic disease management. Domestic and international literature reports that training experienced senior nurses to become health managers and forming health management teams with general practitioners can help improve work efficiency and enhance management outcomes for chronic disease populations. This study explores the feasibility and sustainability of an outpatient chronic disease management model implemented collaboratively by medical-nursing teams composed of general practitioners and internists from private secondary general hospitals together with health managers. General practitioners or internists were assigned as Primary Care Physicians (PCP) for patients with essential hypertension and type 2 diabetes, and physician assistants or senior nurses from corresponding departments were trained as Primary Care Managers (PCM). PCPs and PCMs formed chronic disease management teams to collaboratively carry out health management for chronic disease patients. This study retrospectively reviewed blood pressure and glycated hemoglobin control status among dynamic and fixed patient populations from April 2020 to August 2021, evaluated the effectiveness of chronic disease management implemented by PCP-PCM teams, obtained feedback from PCP-PCM team members on chronic disease management work, and used the Net Promoter Score (NPS) questionnaire to survey patient satisfaction with PCPs. Results showed that the rates of poor blood pressure and blood glucose control among hypertension and diabetes populations both improved significantly, feedback from PCP-PCM team members regarding this chronic disease management model was relatively

positive, and patient NPS scores for PCPs were very high. This chronic disease management model achieved favorable outcomes in health management of hypertension and diabetes patient populations, received positive feedback from PCPs, PCMs, and patients, and demonstrated certain feasibility. However, in the long term, PCM personnel shortages may affect chronic disease management outcomes, warranting continued exploration of the sustainable development of this model.

Full Text

Exploring PCP and PCM Team-Based Model of Chronic Disease Management in Outpatient Department of Family Medicine and Internal Medicine in Level II General Hospital

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Abstract

Chronic non-communicable diseases have become the leading threat to population health. The “Healthy China 2030” plan, announced in 2016, began promoting comprehensive prevention and control of chronic diseases. Primary Care Physicians (PCPs) serve as health gatekeepers for community residents and have actively participated in chronic disease management. Personal Care Managers (PCMs), selected from senior nurses who have received appropriate training, are becoming valuable assistants to PCPs, helping improve chronic disease management outcomes. This article explores the feasibility and sustainability of a PCP-PCM team-based chronic disease management model in the outpatient departments of Family Medicine (FM) and Internal Medicine (IM) in our hospital. FM or IM physicians serve as PCPs for patients with primary hypertension and type 2 diabetes mellitus (T2DM), while physician assistants and senior nurses serve as PCMs. The PCMs actively collaborate with PCPs to provide continuous care for these patients. Clinical data on blood pressure and HbA1c for both dynamic and fixed patient populations from April 2020 to August 2021 were analyzed to assess management effectiveness. Two quality indicators were monitored: the rate of poorly controlled blood pressure (BP $\geq 140/90$ mmHg) and the rate of poorly controlled blood glucose (HbA1c $\geq 8.0\%$).

These rates remained stable in the dynamic population and significantly improved in the fixed population. To further investigate the feasibility and sustainability of this clinical model, surveys were conducted among PCPs, PCMs, and patients. Both PCPs and PCMs provided very positive feedback regarding this chronic disease management model, and the average Net Promoter Score (NPS) for PCPs was very high. In conclusion, the PCP-PCM team-based chronic disease management model helps improve clinical outcomes for patients with primary hypertension and T2DM. The positive feedback from PCPs, PCMs, and patients demonstrates that the model is feasible. However, the shortage of PCMs may impact the effectiveness of chronic disease management, encouraging us to continue exploring solutions to improve the model's sustainability.

Keywords: PCP (Primary Care Physician); PCM (Primary Care Manager); Chronic Disease Management; NPS (Net Promoter Score)

Introduction

In recent years, the prevalence of hypertension and diabetes has continuously risen in China, prompting ongoing practical exploration of chronic disease management by medical institutions and relevant experts, yielding valuable experience and insights [1]. Primary Care Physicians (PCPs) serve as gatekeepers in primary healthcare services for chronic disease management [2]. Studies have shown that trained senior nurses acting as health managers (Primary Care Managers, PCMs) play important roles in patient health management, forming healthcare teams with PCPs that help improve work efficiency and chronic disease management outcomes [3-4]. In recent years, China has also reported on nurse-physician collaboration models for diabetes management [6] and explored integrating physician assistants into chronic disease management teams [7].

In August 2018, our hospital began exploring a PCP-PCM team-based population health management model, subsequently extending it to chronic disease management for patients with hypertension and diabetes, aiming to shift from a clinical care-only model to one that includes patient health management. This study reviews the implementation and outcomes of PCP-PCM team-based chronic disease management over the past three years to evaluate the model's feasibility, sustainability, and clinical opportunities and challenges.

1. Establishment of the PCP-PCM Team-Based Chronic Disease Management Model

1.1 Initial Exploration: PCP-PCM Team-Based Model for Insured Commercial Clients In August 2018, our hospital officially launched a PCP-PCM team-based "managed care" service model for commercial insurance clients. As the sole healthcare provider partner for this insurance company, we provided each insured client with dedicated PCP and PCM services, managing

their health throughout the year—similar to community-based family physician contract services. Within one month of enrollment, clients completed an initial health assessment with their PCP, who then developed a personalized health management plan based on the assessment results. For clients with chronic conditions such as primary hypertension and type 2 diabetes, as well as those with cardiovascular risk factors like obesity, smoking, and dyslipidemia, we arranged regular follow-ups and examinations, provided lifestyle guidance, physical management, and smoking cessation counseling, and continuously monitored improvement.

This one-year pilot program for insurance clients yielded valuable experience in chronic disease management. However, since the average age of insured clients was 60, with a relatively healthy population (40% under 18 years old and few chronic disease patients), the hospital decided to expand the PCP-PCM model to more chronic disease patients beyond the insurance client base.

1.2 Establishing the PCP-PCM Team-Based Chronic Disease Management Model

1.2.1 Defining the Chronic Disease Management Target Population

Beginning in August 2019, we identified patients with hypertension and diabetes from electronic health records. Patients diagnosed with primary hypertension or type 2 diabetes, or those not yet formally diagnosed but meeting diagnostic criteria, were enrolled in the chronic disease management program regardless of department or insurance status, aiming to provide comprehensive services across the hospital. The target population was defined as follows:

Hypertension patient population: Patients who visited our hospital at least three times in the past two years and were diagnosed with primary hypertension, or not yet formally diagnosed but with two separate office blood pressure readings $\geq 140/90$ mmHg (excluding emergency, surgical, and perioperative patients).

Diabetes patient population: Patients who visited our hospital at least three times in the past two years and were diagnosed with type 2 diabetes, or not yet formally diagnosed but with HbA1c $\geq 6.5\%$.

These definitions referenced the Chinese Hypertension Management Guidelines [8] and Chinese Type 2 Diabetes Management Guidelines [9], including patients not yet formally diagnosed but meeting criteria for primary hypertension or type 2 diabetes.

Our Business Intelligence (BI) team initially extracted data on all hypertension and diabetes patients from the previous month and shared it with PCP-PCM teams to initiate continuous management. This target population data was dynamic, with patients continuously joining or leaving (e.g., seeking care elsewhere or relocating).

1.2.2 Implementation of the Chronic Disease Management Model BI data revealed many hypertension and diabetes patients regularly visited cardiology and endocrinology departments. Therefore, both Family Medicine and Internal Medicine specialists (cardiologists and endocrinologists) jointly implemented chronic disease management. Each patient meeting the above criteria was assigned a Family Medicine or Internal Medicine physician as their PCP, matched with a physician assistant or senior nurse as their PCM. As the patient population grew, the PCP-PCM team expanded. By March 2022, our Beijing hospitals and clinics had 44 PCPs and 14 PCMs, maintaining a 3:1 ratio. Over three years, the PCP-PCM teams had managed nearly 3,000 dynamic hypertension and diabetes patients.

The core components of the chronic disease management model included:

PCPs and PCMs scheduled follow-up appointments or examinations at consistent intervals—ideally every three months for patients with stable, well-controlled indicators. For patients with poor control (e.g., latest office BP $\geq 140/90$ mmHg or latest HbA1c $\geq 8\%$), follow-up was arranged every 1-2 months for treatment adjustment and intensive lifestyle guidance until indicators stabilized, after which the interval extended to three months.

PCMs participated on a part-time basis: physician assistant PCMs dedicated 8 hours per week, while senior nurse PCMs dedicated 4 hours per week to chronic disease management.

The PCP, PCM, and patient formed a close “3P” partnership team. For patients with poorly controlled indicators or poor compliance, the 3P team established a WeChat group for regular communication and timely appointment scheduling. This patient-centered collaboration model actively engaged patients, transforming them from passive recipients to active participants in their self-management.

Both Family Medicine and Internal Medicine physicians could serve as PCPs for chronic disease management, with collaborative relationships between departments. For patients with poorly controlled hypertension or diabetes, Family Medicine physicians could promptly refer to cardiology or endocrinology specialists; once stabilized and according to patient preference, they could return to Family Medicine for comprehensive health management. Conversely, Internal Medicine specialists could transfer their managed chronic disease patients to Family Medicine for comprehensive care, then back to specialists for focused disease management if desired. Some patients preferred to remain with Family Medicine for integrated care, enabling PCPs to fulfill their role as primary care physicians. This collaborative relationship between Family Medicine and specialty physicians enabled two-way referrals within the secondary general hospital.

1.3 Clinical Indicator Monitoring and Quality Control The BI team provided monthly data including total hypertension patient numbers and poorly controlled hypertension numbers, total diabetes patient numbers and poorly

controlled diabetes numbers, and calculated “poor blood pressure control rate” and “poor blood glucose control rate.”

Poor blood pressure control rate definition: Latest office blood pressure reading $\geq 140/90$ mmHg, with the percentage of poorly controlled patients among all hypertension patients defined as the “poor blood pressure control rate.”

Poor blood glucose control rate definition: Latest laboratory HbA1c $\geq 8\%$, with the percentage of poorly controlled patients among all diabetes patients defined as the “poor blood glucose control rate.”

Given the dynamic nature of the chronic disease population, the hospital established quality control targets to keep both rates below 20%. Monitoring began in April 2020, with data promptly fed back to PCP-PCM teams with specific patient information (medical record numbers, blood pressure, HbA1c) to facilitate targeted management of poorly controlled patients.

1.4 Questionnaires and Feedback In March 2022, PCP-PCM team members completed a “Questionnaire Star” survey, providing practical feedback on the chronic disease management model to help evaluate its feasibility and sustainability. For patient satisfaction assessment, the hospital used its longstanding Net Promoter Score (NPS) survey across all departments. The NPS survey measures satisfaction with physicians, nurses, pharmacists, front desk staff, and billing personnel, though it is not customized for specific programs. The NPS question regarding physicians asks: “How likely are you to recommend Dr. XXX to your friends or family (0-10)?” Scores of 0 indicate “definitely not,” while 10 indicates “definitely yes.” Scores of 9-10 are “promoters,” 0-6 are “detractors,” and 7-8 are “passives” (excluded from scoring). $NPS = (\text{Promoters}/\text{Total respondents}) \times 100\% - (\text{Detractors}/\text{Total respondents}) \times 100\%$.

2. Results

2.1 Dynamic Population Management Outcomes From April 2020 to August 2021, the number of hypertension patients under management increased from 1,024 to 1,468, with poorly controlled cases increasing from 211 to 295, reflecting population dynamics. The “poor blood pressure control rate” fluctuated between 18.34% and 20.82%, generally meeting the $<20\%$ quality control target. During the same period, diabetes patients increased from 364 to 548, with poorly controlled cases rising from 75 to 133. The “poor blood glucose control rate” ranged from 14.92% to 24.31%, with significant fluctuations. Some months exceeded the 20% target.

The large fluctuations in “poor blood glucose control rate” occurred because some patients had HbA1c tests performed externally, with results not entered into our electronic health records. To address this data quality issue, PCMs were instructed to inquire about external HbA1c results during follow-ups and enter them into the system. This measure largely resolved the data problem

and ensured accurate automatic calculation of the “poor blood glucose control rate.”

2.2 Fixed Population Management Outcomes We hypothesized that management outcomes would be better in a fixed population because PCP-PCM teams would become more familiar with patients, enabling more continuous care. To test this, we retrospectively analyzed patients who continuously received chronic disease management from April 2020 to August 2021. A total of 693 fixed patients were identified (582 hypertension, 219 diabetes, with 108 having both conditions). Data were analyzed separately for each disease.

Among hypertension patients, 77.15% (449/582) were assigned PCPs and PCMs. The poor blood pressure control rate decreased from 24.74% in April 2020 to 15.42% in August 2021, showing excellent management outcomes. Among diabetes patients, 83.56% (183/219) had assigned PCPs and PCMs. The poor blood glucose control rate decreased from 19.18% to 16.67%, with initial excellent outcomes, subsequent fluctuations, and then a downward trend following PCP-PCM team efforts.

2.3 Survey Results

2.3.1 PCP Team Survey Results Survey results showed that 84.09% of physicians believed the PCP-PCM collaborative chronic disease management program was helpful for patients, 84.41% believed patient compliance with regular follow-ups had improved, 72.73% reported improvements in patient blood pressure and/or blood glucose indicators, and 61.36% noted improved patient lifestyles. Overall, PCPs responded very positively to this chronic disease management model.

2.3.2 PCM Team Survey Results Survey results indicated that 78.57% of PCMs reported spending 4 hours per week on emails and/or phone communications with chronic disease patients, while 14.29% and 7.14% reported spending 8 hours or more per week, respectively. Approximately half (57.14%) of PCMs felt their workload was heavy relative to the number of managed chronic disease patients. However, 78.57% found the chronic disease management work meaningful and rewarding. Overall, feedback was very positive, though PCMs also experienced significant work-related pressure.

2.3.3 Patient Satisfaction with PCPs From April 2020 to August 2021, 170 NPS surveys were collected from the 693 fixed chronic disease patients (response rate: 29.21%). Despite the low response rate, this exceeded the 15% response rate from general Family Medicine and Internal Medicine patients and the hospital-wide average of 10%. Based on the question “How likely are you to recommend Dr. XXX (your PCP) to friends or family?”, the average NPS score for PCPs was 91, indicating these chronic disease patients were very willing to

recommend their PCPs. This score was higher than the Family Medicine department average of 86 and Internal Medicine department average of 80, demonstrating high satisfaction and loyalty among fixed chronic disease patients.

3. Discussion: Feasibility and Sustainability of the PCP-PCM Team-Based Chronic Disease Management Model

3.1 Feasibility of the Chronic Disease Management Model Our hospital's Family Medicine and Internal Medicine departments established PCP-PCM teams to collaboratively manage eligible hypertension and diabetes patients, achieving positive outcomes. Data showed stable management effects in the dynamic population, meeting or slightly exceeding quality control targets, while the fixed population demonstrated excellent outcomes. Survey feedback from PCPs and PCMs was very positive, indicating the model is feasible and effective. Fixed chronic disease patients gave PCPs high NPS scores, exceeding department averages and reflecting strong patient recognition and loyalty. While the NPS survey's advantage lies in its simplicity—a single comprehensive question used by many healthcare institutions—it has limitations [10]. Moreover, the NPS survey is not customized specifically for chronic disease management patients, lacking specificity and feedback on PCM satisfaction, which should be addressed in future work. Building on hypertension and diabetes management experience, we are expanding management to other high-risk ASCVD patients and will implement continuous management for asthma and COPD.

3.2 Sustainability of the Chronic Disease Management Model The success of the PCP-PCM team-based model largely depends on team members' proactivity and coordination. While our PCPs are full-time physicians, most PCMs are part-time physician assistants and senior nurses with limited staffing—only one-third the number of PCPs. This differs significantly from foreign chronic disease management teams and even from the 1:1 physician-nurse ratio in domestic community family physician teams. Despite this, the PCM team achieved excellent outcomes through strong collaboration, likely due to: (1) 93% of PCMs hold bachelor's degrees or higher, 86% have over 10 years of experience, 71% have worked at our hospital for \$5 years (36% for \$10 years), and 71% are certified health managers, bringing rich experience to their PCM roles; (2) enrolled chronic disease patients had relatively stable conditions requiring mostly guidance and self-management support rather than intensive interventions.

However, the growing patient population and increasing service demands pose sustainability challenges, particularly regarding team member workload and incentives—especially for non-physician team members [13]. Survey results showed half of PCMs felt overburdened. Increasing workload without adequate incentives may cause burnout, affecting proactivity and long-term sustainability. We will explore more possibilities in PCM staffing and incentive mechanisms to ensure sustained support for this chronic disease management model. As a sec-

ondary general hospital, balancing cost and service quality remains an important consideration. With proactive PCM engagement, we can increase regular follow-up rates and overall revenue, so even with more PCM staff, the financial burden would not substantially increase.

3.3 Opportunities and Challenges for Secondary General Hospitals

Domestic and international chronic disease management models emphasize community-based care, highlighting the importance of primary care teams [14-17]. Numerous studies report that patient-centered healthcare teams with trust, clear division of labor, and close collaboration effectively improve clinical outcomes [4-6, 11-13]. Secondary general hospitals differ from community-based family medicine teams, as clinical services (including Family Medicine) traditionally focus on disease treatment rather than comprehensive health management, with limited family physician contract services [18-21]. However, with national policy promoting graded diagnosis and treatment, secondary general hospitals face market and medical development challenges. Our hospital must strengthen continuous, personalized management for chronic disease patients to meet market demands and expand managed care markets under commercial insurance. The 2022 national policy encouraging secondary and tertiary hospital physicians to join family physician teams and support community-based services [22] validates our exploration.

In summary, our hospital's PCP-PCM team-based chronic disease management model has achieved ideal initial outcomes with positive feedback from PCPs, PCMs, and patients, demonstrating feasibility worthy of further summary and experience. Sustainability requires continued exploration.

Author Contributions: GAO Yanli conceived and designed the study, drafted and revised the manuscript; WANG Hongjun performed primary data collection; SUN Fei provided important suggestions on study design; JI Xiangqin provided partial data support; CHANGIZI Roohollah participated in conception and proofread the English abstract.

Conflict of Interest: The authors declare no conflict of interest.

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