Postprint of a Study on Medication Adherence and Its Influencing Factors in Patients After Percutaneous Coronary Intervention

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Abstract

Background Due to the widespread application of percutaneous coronary intervention (PCI) technology, postoperative cardiac rehabilitation in these patients has garnered significant attention. With evolving social trends and policy directions, the community has gradually become a pivotal domain for cardiac rehabilitation in PCI patients. Although medication adherence has shown improvement, the outcomes remain suboptimal. Objective To investigate the current status of community medication adherence among PCI patients, explore its influencing factors, and propose countermeasures. Methods From May 2021 to May 2022, 200 eligible post-PCI patients were selected from 10 community health service centers in Beijing using convenience sampling. The Morisky Medication Adherence Scale was used to evaluate patients' medication adherence. Patients with a Morisky Medication Adherence Scale score of 8 were included in the excellent adherence group, while those with scores <8 were included in the general adherence group. Logistic regression analysis was employed to explore influencing factors of medication adherence in post-PCI patients. Results A total of 181 valid questionnaires were collected, with an effective response rate of 90.5%. The age range of the 181 patients was 41-90 years, with a mean age of (68.6$±$11.2) years. Comparisons between the general adherence group and excellent adherence group of post-PCI patients revealed statistically significant differences in age, monthly personal income, family care status, diabetes prevalence, medication literacy questionnaire scores, PHQ-9 scores, and PCI duration (P<0.05). Multivariate logistic regression analysis results indicated that family care status (OR=0.092, 95%CI=0.031-0.276), PCI duration (OR=0.882, 95%CI=0.794-0.979), medication literacy questionnaire scores (OR=3.044, 95%CI=1.881-4.927), and PHQ-9 scores (OR=0.067, 95%CI=0.021-0.210) were influencing factors of medication adherence in post-PCI patients (P<0.05). Conclusion The medication utilization rate in post-PCI patients decreases year by year, and overall medication adherence is unsatisfactory. Affected by factors such as family care status,

PCI duration, medication literacy questionnaire scores, and depression status, targeted health management and follow-up content should be provided, and long-term stable and good doctor-patient relationships should be strengthened to effectively improve patient medication adherence.

Full Text

Study on Medication Adherence and Its Influencing Factors in Patients After Percutaneous Coronary Intervention

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Abstract

Background: Due to the widespread application of percutaneous coronary intervention (PCI), postoperative cardiac rehabilitation has garnered significant attention. Driven by social development trends and policy orientation, community-based care has emerged as a critical setting for cardiac rehabilitation in PCI patients. While medication adherence has shown improvement, it remains suboptimal.

Objective: To examine the current status of medication adherence among PCI patients in community settings, identify its influencing factors, and propose targeted interventions.

Methods: Between May 2021 and May 2022, we recruited 200 eligible post-PCI patients from 10 community health service centers in Beijing using convenience sampling. Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS-8). Patients scoring 8 points were classified into the excellent adherence group, while those scoring <8 points were assigned to the general adherence group. Logistic regression analysis was employed to explore factors influencing medication adherence.

Results: A total of 181 valid questionnaires were collected (response rate: 90.5%). Participants ranged from 41 to 90 years old (mean age: 68.6 ± 11.2 years). Significant differences between the general and excellent adherence groups were observed in age, personal monthly income, family caregiving responsibilities, diabetes status, medication literacy questionnaire scores, PHQ-9 scores, and PCI duration ($P < 0.05$). Multivariate logistic regression revealed

that family caregiving burden (OR = 0.092, 95% CI = 0.031–0.276), PCI duration (OR = 0.882, 95% CI = 0.794–0.979), medication literacy questionnaire scores (OR = 3.044, 95% CI = 1.881–4.927), and PHQ-9 scores (OR = 0.067, 95% CI = 0.021–0.210) were significant predictors of medication adherence ($P < 0.05$).

Conclusion: Medication utilization rates among PCI patients decline annually, with overall adherence remaining suboptimal. Family caregiving burden, PCI duration, medication literacy, and depressive status significantly influence adherence. Targeted health management and follow-up interventions should be implemented to strengthen long-term, stable doctor-patient relationships and effectively improve medication adherence.

Keywords: percutaneous coronary intervention; secondary prevention drugs for coronary heart disease; medication adherence; community; medication literacy

Introduction

In recent years, percutaneous coronary intervention (PCI) has become a widely utilized and highly effective primary treatment for coronary heart disease patients, with success rates reaching up to 90% or higher [1]. However, secondary prevention medications for coronary heart disease remain the cornerstone of postoperative cardiac rehabilitation [2]. Clinical practice in community settings reveals suboptimal medication use among these patients, with varying degrees of non-adherence. Previous studies have also documented low utilization rates and frequent unauthorized medication changes among post-PCI patients [3]. One study investigating patients from 2005 to 2017 found that the combined use of any antiplatelet agent, beta-blocker, and statin declined from 67% at 1 year to 53% at 5 years post-PCI, while quadruple therapy (adding ACEI/ARB) decreased from 40% to 38% over the same period [4]. Although community-based follow-up management for post-PCI patients has gradually improved, medication adherence—particularly long-term adherence—remains generally low [5-6], warranting further investigation of underlying causes.

To address this gap, our study incorporated medication literacy questionnaires and anxiety/depression scales to assess the current status of community-based medication adherence among post-PCI patients in Beijing and analyze its influencing factors, thereby providing an evidence base for effective standardized management in community settings.

Methods

Study Design and Participants This multicenter retrospective study employed convenience sampling to recruit post-PCI patients visiting outpatient clinics at 10 community health service centers in Beijing between May 2021 and

August 2022. Inclusion criteria were: (1) confirmed coronary heart disease diagnosis and PCI procedure at a secondary-level or higher hospital; (2) age $\geq$ 18 years; and (3) voluntary participation after understanding the study purpose. Exclusion criteria included: (1) psychiatric disorders, severe memory impairment, or cognitive dysfunction preventing survey completion; and (2) refusal to participate. The study protocol adhered strictly to medical ethics principles. Participants were informed about the study content and significance, assured of confidentiality, and provided written informed consent before completing the questionnaire. Of 200 distributed questionnaires, 181 valid responses were collected (response rate: 90.5%).

Measurement Instruments General Information Questionnaire: Developed through literature review and expert consultation, this questionnaire collected data on gender, age, marital status, education level, living situation, employment status, personal monthly income, family caregiving responsibilities, hypertension, diabetes, medication literacy questionnaire scores, GAD-7 scores, PHQ-9 scores, postoperative medication types, and PCI duration.

Medication Literacy Questionnaire [7]: This 9-item instrument assesses medication literacy. Items 7 and 9 (asking yes/no and specific medication names, respectively) are not scored. Total possible score is 7 points, with 6–7 points indicating high medication literacy and 0–5 points indicating low literacy. Excluding items 7 and 9, the questionnaire demonstrated good reliability (Cronbach' s $\alpha = 0.772$).

Morisky Medication Adherence Scale (MMAS-8) [8]: This 8-item scale measures medication adherence. Items 1–7 are scored 0 for "yes" and 1 for "no," with item 5 reverse-scored. Item 8 uses a 5-point Likert scale ("always" to "never") scored as 0, 0.25, 0.50, 0.75, and 1.00, respectively. Total scores range from 0 to 8, with <6 indicating poor adherence, 6–<7.75 indicating fair adherence, and 8 indicating good adherence. Patients scoring 8 were assigned to the excellent adherence group, while those scoring <8 comprised the general adherence group. The scale showed good reliability (Cronbach' s $\alpha = 0.754$).

Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) [9]: These scales assess anxiety and depression. The GAD-7 comprises 7 items scored 0–3 (total range: 0–21), with 0–4 indicating normal and 5–21 indicating anxiety. The PHQ-9 includes 9 items scored 0–3 (total range: 0–27), with 0–4 indicating normal and 5–27 indicating depression. Both scales demonstrated good reliability (Cronbach' s $\alpha = 0.785$ and 0.853, respectively).

Data Collection and Quality Control Trained investigators collected data through face-to-face interviews using structured questionnaires. After explaining the questionnaire, participants completed it independently, with "question-and-answer" assistance provided as needed. Investigators reviewed completed questionnaires on-site for omissions or errors, prompting immediate corrections

when possible. Invalid questionnaires with uncorrectable errors were excluded. Data were double-entered and verified through computer-based error checking. Statistical experts were consulted to ensure analytical accuracy.

Statistical Analysis SPSS 25.0 software was used for data analysis. Normally distributed continuous variables are presented as mean ± standard deviation and compared using t-tests. Categorical variables are expressed as frequencies and percentages and compared using ^{2} tests. Logistic regression analysis identified factors influencing medication adherence. Statistical significance was set at $P < 0.05$.

Results

Participant Characteristics The 181 participants ranged from 41 to 90 years old (mean: 68.6 ± 11.2 years), with 70.2% male (127/181). Most had high school education or higher (63.0%, 114/181), lived with others (91.7%, 166/181), and had monthly incomes ≥ 5,000 yuan (60.2%, 109/181). Participants had 1-6 stents (mean: 1.96 ± 1.02) and PCI duration ranged from 0 to 22 years (mean: 7.09 ± 5.17 years). Current secondary prevention medications ranged from 2 to 5 types (mean: 4.57 ± 0.72). Comorbidities included hypertension (84.5%, 153/181), diabetes (48.1%, 87/181), stroke (17.1%, 31/181), chronic osteoarthritis (9.4%, 17/181), chronic pulmonary disease (5.0%, 9/181), chronic digestive disease (5.0%, 9/181), and cancer (0.6%, 1/181). Mean scores were: GAD-7 = 1.80 ± 2.91, PHQ-9 = 2.82 ± 3.91, and medication literacy = 5.92 ± 1.34. Mean medication adherence score was 6.16 ± 2.09.

Medication Use Patterns Medication utilization declined over time post-PCI. Among all patients, antiplatelet agents were used by 98.9% (179/181), statins by 98.3% (178/181), beta-blockers by 80.1% (145/181), and ACEI/ARB by 63.5% (115/181). Quadruple therapy (antiplatelet + statin + beta-blocker + ACEI/ARB) was used by 59.1% (107/181). Among patients 2-5 years post-PCI, antiplatelet use was 94.3% (50/53), statins 90.6% (48/53), beta-blockers 73.6% (39/53), ACEI/ARB 54.7% (29/53), quadruple therapy 41.5% (22/53), and dual antiplatelet therapy 38% (20/53). Among patients $ $5 years post-PCI, antiplatelet use was 91.3% (84/92), statins 87.0% (80/92), beta-blockers 65.2% (60/92), ACEI/ARB 48.9% (45/92), quadruple therapy 33.7% (31/92), and dual antiplatelet therapy 13% (12/92).

Univariate Analysis of Medication Adherence Influencing Factors Significant differences between the general and excellent adherence groups were found in age, personal monthly income, family caregiving responsibilities, diabetes status, medication literacy scores, PHQ-9 scores, and PCI duration ($P < 0.05$). No significant differences were observed in gender, marital status, education level, living situation, employment status, hypertension, GAD-7 scores, or number of medication types ($P > 0.05$) .

Logistic Regression Analysis Using medication adherence status as the dependent variable (general adherence = 0, excellent adherence = 1) and statistically significant variables from univariate analysis as independent variables , logistic regression revealed that family caregiving responsibilities (OR = 0.092, 95% CI = 0.031-0.276), PCI duration (OR = 0.882, 95% CI = 0.794-0.979), medication literacy scores (OR = 3.044, 95% CI = 1.881-4.927), and PHQ-9 scores (OR = 0.067, 95% CI = 0.021-0.210) significantly influenced medication adherence ($P < 0.05$) .

Discussion

Medication Utilization Patterns in Post-PCI Patients This study demonstrates declining medication utilization rates over time, particularly pronounced for beta-blockers and ACEI/ARB agents. The quadruple therapy utilization rate was only 33.7% at $ $5 years post-PCI, indicating generally suboptimal adherence—consistent with previous research [11-12]. With policy-driven patient decentralization to community care, prolonged dual antiplatelet therapy beyond one year post-stenting and inadequate dosing or self-discontinuation of antihypertensive, hypoglycemic, and lipid-lowering agents have become common findings in community follow-up, often with poor control of risk factors and prognostic indicators [13-14]. Our results confirm 不规范 antiplatelet use across different post-PCI durations.

Factors Influencing Medication Adherence No statistically significant differences were found for gender, marital status, education, living situation, employment status, or personal economic status ($P > 0.05$). Previous research has identified drug intolerance as an uncontrollable factor affecting adherence [15].

Our participants had a mean age of 69.0 ± 8.2 years, and advancing age may negatively impact adherence ($P < 0.05$). Family caregiving responsibilities, diabetes comorbidity, higher medication literacy scores, and absence of depression positively influenced adherence ($P < 0.05$). In community-based chronic disease management, family functioning and social support levels are crucial determinants of medication adherence [16]. Medication literacy—the ability to obtain, accurately understand, and properly process basic medication information to make appropriate decisions—directly affects adherence. Patients with low medication literacy may reduce, miss, or discontinue doses due to discomfort or concerns about side effects, diminishing self-efficacy for appropriate medication use [17]. Our finding of positive correlation between medication literacy and adherence scores aligns with this research.

As PCI duration increases (OR = 0.882, 95% CI = 0.794-0.979), adherence declines annually ($P < 0.05$). Over time, patients may mistakenly believe they can reduce or discontinue medications after stabilization, and their engagement in follow-up visits may decrease, collectively contributing to deteriorating long-term adherence.

Interventions and Recommendations Tailored interventions should be implemented in community family practice settings based on patient characteristics. Utilizing health education seminars, WeChat or SMS medication reminders, and other digital platforms can improve adherence [18-19]. Establishing integrated medical-nursing teams through healthcare consortium platforms enables specialist-generalist two-way referral models, ensuring timely assessment and guidance while reducing medical burdens [20-21]. Contracted family doctor teams providing personalized services, enhanced clinical-pharmacist collaboration, and fully leveraging healthcare consortium functions can significantly improve adherence [22-23].

Low medication literacy directly impairs proper medication cognition and behavior. Healthcare providers performing PCI and follow-up should deliver comprehensive medication education from multiple perspectives. Our finding that patients with family caregiving burdens had lower medication utilization suggests reduced self-focus due to caregiving demands. Therefore, community follow-up should emphasize long-term continuous management, using diverse approaches to enhance medication knowledge and effective use, with individualized interventions targeting specific influencing factors.

Conclusion

Medication utilization rates among post-PCI patients decline annually, with overall adherence remaining suboptimal. Family caregiving burden, PCI duration, medication literacy, and depressive status significantly influence adherence. Targeted health management and follow-up interventions should be implemented to strengthen long-term, stable doctor-patient relationships and effectively improve medication adherence.

Author Contributions

Li Chen: literature search, data collection and analysis, manuscript writing and revision. Weihong Xiong: study conception. Xiaoqin Lu: study conception, manuscript review and final approval.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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