Impact of Monthly Community Follow-Ups in Knee Osteoarthritis Management for Elderly Patients

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Financial support: This study was funded by the Research Program of the Second Rehabilitation Hospital of Shanghai (Grant No.Y2024-10&12) and the Medical and Health Project of Baoshan District Science and Technology Commission(Grant No. 2024-E-64)
Conflict of interest: None declared

Background: Chronic knee osteoarthritis (KOA) severely affects elderly populations, yet optimal pain management remains elusive. While community interventions show rehabilitation potential, evidence comparing structured follow-up frequencies is limited. This randomized trial compared intensified monthly community follow-ups vs semi-annual monitoring for improving pain control, functional capacity, and quality of life in elderly patients with KOA.

Material/Methods: A total of 112 elderly patients with KOA were enrolled and randomly assigned to either a control group (semi-annual follow-ups) or a follow-up group (monthly community interventions including pain management education and exercise adherence supervision) during the 14-month study. Outcomes were assessed using the visual analog scale (VAS), Knee Injury and Osteoarthritis Outcome Score (KOOS), and Short Form Health Survey (SF-36). Statistical analyses performed with SPSS 27.0 included paired-sample *t* tests for intra-group changes and independent-sample *t* tests for inter-group comparisons.

Results: The control group showed a significant reduction in VAS scores at the final assessment ($P<0.05$). The follow-up group showed significant improvements across VAS, KOOS, and SF-36 scores ($P<0.05$). Improvements in VAS, KOOS, and SF-36 scores were significantly greater in the follow-up group than in the control group ($P<0.05$). Furthermore, changes in VAS scores were correlated with changes in KOOS and SF-36 scores ($P<0.05$).

Conclusions: Regular community follow-ups significantly enhanced pain management, functional outcomes, and quality of life among elderly patients with KOA. By fostering adherence to exercise regimens, this approach proved to be a viable strategy for enhancing rehabilitation outcomes, meriting its broader adoption in clinical practice.

Keywords: Community Health Services • Community Medicine • Knee Joint • Pain • Rehabilitation

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/947224

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Introduction

Chronic knee osteoarthritis (KOA) represents a prevalent degenerative joint disorder in the elderly, predominantly manifesting as joint pain, stiffness, and functional disability. The symptomatic burden, particularly knee pain, greatly diminishes quality of life and restricts the daily activities of affected individuals [1]. Globally, an estimated 25 million individuals are affected by KOA, with a disproportionate prevalence observed in those aged 50 years and older [2]. The pathophysiology of KOA is characterized by cartilage degeneration, narrowing of joint spaces, and osteophyte formation. Risk factors include aging, obesity, joint trauma, and genetic susceptibility [3].

Current therapeutic approaches for KOA encompass pharmacological, physical, lifestyle, and surgical interventions [4]. Pharmacological agents such as non-steroidal anti-inflammatory drugs are effective in symptomatic relief but are associated with adverse effects, including gastrointestinal and cardiovascular risks, especially when used long term [5]. Non-surgical strategies, such as physical therapy and home-based exercise programs, are widely recommended for KOA management, but patient adherence is often suboptimal due to a lack of professional supervision, thereby limiting their therapeutic benefits [6]. Surgical intervention, including total knee arthroplasty, is generally reserved for advanced cases in which conservative measures fail to achieve adequate symptom control [7].

In recent years, regular community follow-ups have gained prominence as a promising model for KOA rehabilitation management. These follow-ups facilitate consistent engagement between healthcare providers and patients, providing tailored health education, exercise guidance, and psychological support. Such interventions are posited to enhance patient adherence to prescribed regimens and improve rehabilitation outcomes [8]. This approach is particularly advantageous for chronic conditions, such as KOA, which necessitate sustained management and continuous behavioral modification [9].

The present study aims to assess the effect of regular community follow-ups on the rehabilitation outcomes of elderly patients with KOA, specifically targeting pain reduction, functional improvement, and quality of life enhancement. The study compares the efficacy of semi-annual follow-ups with that of monthly community-based follow-ups, using the VAS, KOOS, and SF-36 as outcome measures. Follow-up activities primarily involved telephone consultations centered on health education and exercise guidance. The findings of this research are expected to contribute valuable insights to optimize KOA rehabilitation strategies.

Material and Methods

Study Participants

Participants were recruited from patients registered under family doctor services at the Anting Community Health Service Center in Jiading District, Shanghai, between June 1, 2023, and August 1, 2024. The inclusion criteria were (1) age between 60 and 85 years; (2) diagnosis of KOA confirmed through clinical symptoms and imaging with Kellgren-Lawrence (KL) grade II-III; (3) disease duration exceeding 6 months, with ongoing symptoms affecting daily activities; (4) VAS score of ≥4; (5) cognitive capacity to comply with follow-up and assessment procedures as evidenced by Mini-Mental State Examination (MMSE) score ≥24; and (6) informed consent to participate. Exclusion criteria included (1) severe cardiovascular, hepatic, or renal disease; (2) history of knee surgery or intra-articular injections within the past 6 months; (3) body mass index ≥30 kg/m^2; (4) MMSE score <24 or psychiatric disorders; and (5) withdrawal or protocol deviations affecting data integrity.

Study Design

This longitudinal investigation spanned 14 months (June 2023-August 2024), comprising 6 months of active intervention and 2 months of post-intervention outcome assessment.

Sample Size Calculation

Sample size determination was done using a 2-tailed hypothesis test with an expected medium effect size (Cohen d=0.5), statistical power of 80%, and a significance level (α) of 0.05. Calculations using G*Power 3.1 software suggested a requirement of 51 participants per group, totaling 102. Considering a potential dropout rate of 10%, the final recruitment was aimed for 112 participants, who were then randomly allocated to control and follow-up groups.

Group Allocation

Randomization was conducted using a computer-generated random number sequence stratified by KL grade (II vs III). Participants were assigned to their respective groups following baseline assessments, with allocation concealment done using opaque sealed envelopes. Radiographic assessments were independently verified by 2 musculoskeletal radiologists blinded to group allocation. Randomization and data analysis were managed by 2 independent statisticians, to mitigate selection bias. There were no statistically significant differences in baseline characteristics between groups, including KL grade distribution (control group: 50% grade II, follow-up group: 51.8% grade II, χ^2=0.04, P=0.841), sex, age, body mass index (control: 26.1±2.3 kg/m^2 vs follow-up: 25.8±2.1 kg/m^2, P=0.512), MMSE

Table 1. Comparison of general information and pre-intervention scale scores between the 2 groups of patients.

| Groups | n | Age | Sex | | VAS | KOOS | SF-36 |
			Female	Male			
Control	56	70.82±4.05	29	27	5.33±1.45	50.82±17.19	47.32±18.70
Follow-up	56	69.88±3.95	28	28	5.56±1.37	49.91±18.52	47.79±18.51
T/χ^2 value		1.25	0.01		-0.84	0.27	-0.13
P value		0.213	0.99		0.404	0.788	0.895

VAS – visual analog scale; KOOS – Knee Injury and Osteoarthritis Outcome Score; SF-36 – Short Form Health Survey.

Figure 1. Community follow-up of elderly patients with chronic knee osteoarthritis. (*The doctor in the picture is one of the authors of this article*).

scores (control: 27.5±1.2 vs follow-up: 27.3±1.4, *P*=0.387), and initial VAS, KOOS, and SF-36 scores (*P*>0.05), thereby ensuring comparability (**Table 1**).

Follow-Up Protocol

Control Group

The treatment of patients in the control group followed the standard family doctor protocol, receiving 2 structured follow-ups at baseline and the 6-month endpoint. Assessments at the initial and final follow-ups included VAS, KOOS, and SF-36 evaluations, along with education on pain management and general health promotion.

Follow-Up Group

In addition to the standard follow-up regimen, the follow-up group underwent monthly community-based follow-ups over 6 months, delivered through in-person and telehealth modalities. These follow-ups provided specialized education on KOA pathophysiology, exercise management, and lifestyle modifications, with an emphasis on adherence to home-based exercise prescriptions. Follow-ups were conducted by general practitioners or rehabilitation therapists trained in managing KOA (**Figure 1**).

Assessment Tools

Visual Analog Scale

The VAS was used to evaluate the intensity of pain as perceived by the patients. It consists of a 10-cm-long line, representing a continuum from "no pain" (0 points) to "worst imaginable pain" (10 points). Patients indicated their pain level by marking on the line. The VAS is widely used in clinical settings for its simplicity and efficacy in assessing treatment-related changes in pain.

Table 2. Results of within-group comparisons between the 2 groups before and after treatment.

Group	Scale	Mean±SD		T value	P value
		Initial follow-Up	Final follow-Up		
Control	VAS	5.33±1.45	4.57±1.48	35.86	<0.01
	KOOS	50.82±17.19	51.16±16.94	-1.60	0.115
	SF-36	47.32±18.70	48.80±15.19	-1.09	0.281
Follow-up	VAS	5.56±1.37	3.56±1.40	53.90	<0.01
	KOOS	49.91±18.52	57.02±16.79	-16.89	<0.01
	SF-36	47.79±18.51	55.30±15.87	-12.26	<0.01

VAS – visual analog scale; KOOS – Knee Injury and Osteoarthritis Outcome Score; SF-36 – Short Form Health Survey.

Knee Injury and Osteoarthritis Outcome Score

The KOOS evaluates knee function and quality of life across 5 dimensions: pain, symptoms, daily living activities, sports and recreational activities, and quality of life. Scores for each domain are derived from patient responses to a questionnaire, with higher scores reflecting better function and lower symptom severity.

Short Form Health Survey

The SF-36 is a comprehensive assessment tool used to gauge general health and quality of life, encompassing 8 domains: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. Scores range from 0 to 100, with higher values indicating superior health status and well-being.

Cognitive Assessment

The Chinese version of the MMSE was administered to screen for cognitive impairment, with higher scores indicating better cognitive function (range 0-30).

Statistical Analysis

Data analysis was performed using SPSS 27.0 (IBM Corp, Armonk, NY, USA). Continuous outcomes (VAS, KOOS, SF-36) were analyzed under intention-to-treat principles, with missing values from 7 dropouts (3 control, 4 follow-up) addressed via last observation carried forward.

Between-group differences in changes from baseline to 6 months were assessed using independent t tests after verifying normality (Shapiro-Wilk $P>0.05$) and homogeneity of variance (Levene $P>0.10$). Within-group improvements were evaluated with paired t tests. Effect sizes (Cohen d) with 95% CIs were calculated to contextualize clinical significance against the minimal clinically important difference for KOOS (10-point threshold).

Categorical variables (KL grade distribution, sex) were compared using Pearson's χ^2 tests. Sensitivity analyses reconfirmed findings through per-protocol analysis of 105 completers. All tests were 2-sided at $\alpha=0.05$, with adjustment for multiple comparisons applied to KOOS subdomains using the Benjamini-Hochberg procedure.

Results

Within-Group Comparisons

The control group demonstrated a significant reduction in VAS scores at the final assessment ($P<0.05$), whereas KOOS and SF-36 scores did not show significant changes ($P>0.05$). In contrast, the follow-up group exhibited significant improvements in VAS, KOOS, and SF-36 scores at the final assessment, compared with baseline ($P<0.05$), as illustrated in **Table 2**.

Between-Group Comparisons

Inter-group comparisons revealed significant differences in changes across VAS, KOOS, and SF-36 scores, with the follow-up group experiencing more pronounced improvements ($P<0.05$), as summarized in **Table 3**.

Correlation Analysis of VAS, KOOS, and SF-36

Pearson correlation analysis indicated that changes in VAS were significantly correlated with changes in KOOS (r=-0.23, $P<0.05$) and SF-36 (r=-0.34, $P<0.05$). Linear regression models demonstrated that KOOS and SF-36 each had limited explanatory power for VAS changes ($R^2<0.3$). Specifically, a 1-point decrease in VAS corresponded to an average increase of 0.60 points in KOOS ($R^2=0.06$) and an average increase of 1.55 points in SF-36 ($R^2=0.10$) (**Figure 2**),

Table 3. Results of inter-group comparisons between the 2 groups before and after treatment.

Scale	Amount of change before and after treatment		T value	P value
	Control	Follow-up		
VAS	-0.77±1.32	-2.00±1.06	28.82	<0.01
KOOS	0.34±1.59	7.11±7.14	-14.36	<0.01
SF-36	1.48±10.19	7.51±9.24	-4.04	<0.01

VAS – visual analog scale; KOOS – Knee Injury and Osteoarthritis Outcome Score; SF-36 – Short Form Health Survey.
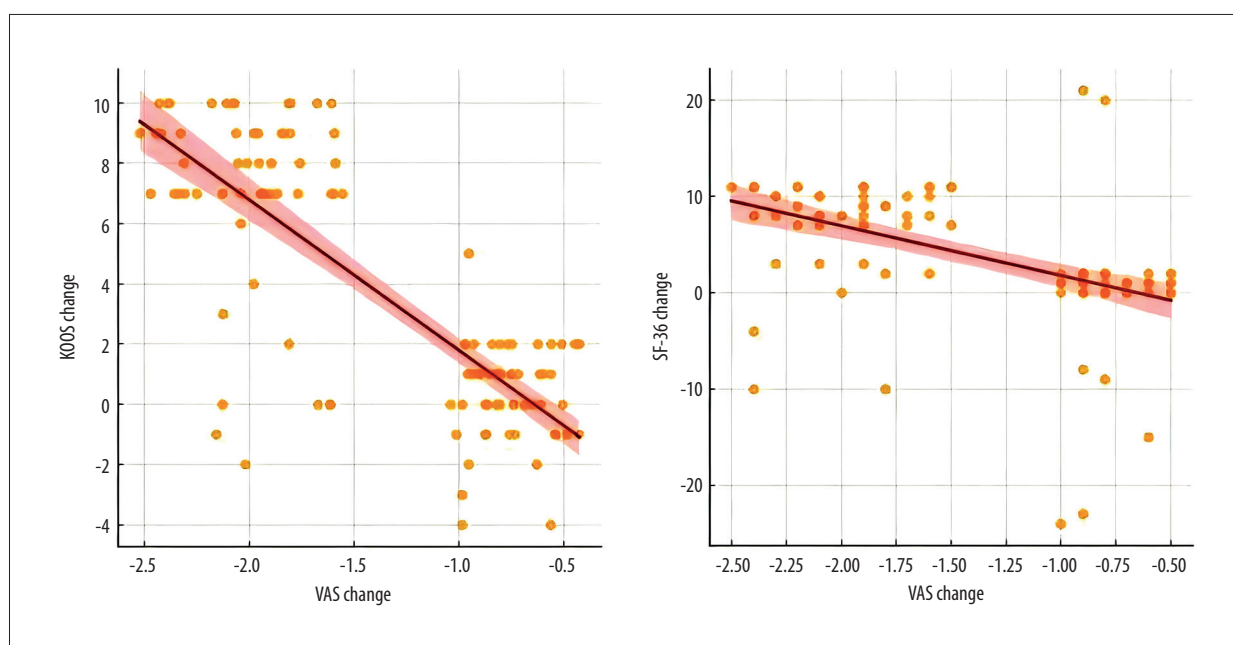

Figure 2. Results of correlation analysis between visual analog scale (VAS) and Knee Injury and Osteoarthritis Outcome Score (KOOS), and VAS and Short Form Health Survey (SF-36).

Discussion

This study investigated the effect of regular community follow-ups on pain management among patients with chronic KOA. By comparing a control group receiving biannual follow-ups with an experimental group receiving monthly community-based follow-ups, the results indicated that community follow-ups significantly surpassed the control group in terms of pain alleviation, improved knee function, and enhanced overall health status. These findings provide compelling evidence that supports the integration of community healthcare services as an essential component in the management of chronic diseases.

The observed benefits of community follow-ups for KOA patients were primarily attributed to significantly improved adherence to prescribed exercise regimens. Regular exercise is recognized as a fundamental intervention for mitigating disease progression, delaying joint degeneration, and alleviating pain in patients with KOA [10]. Emerging evidence highlights the adaptability of community-based approaches: recent trials combining web-based self-directed programs with automated text messaging achieved 72.1% clinically meaningful pain improvement through technology-enhanced supervision [11], while water-based regimens led by physiotherapists demonstrated 100% improvement in knee strength through structured environmental adaptation [12]. Although differing in delivery mode, these successes share a common thread the strategic integration of continuous engagement into community care frameworks. Our model extended this paradigm through monthly in-person interactions, which uniquely addressed non-technological barriers prevalent in elderly populations. However, in practice, adherence to prescribed exercise plans is challenging for many patients due to various barriers [13], as demonstrated by the control group in this study. Factors such as lack of supervision, decreased motivation, and skepticism regarding the efficacy of exercises are common reasons for poor adherence [14]. This poor adherence adversely affects treatment outcomes, thereby delaying rehabilitation or exacerbating symptoms.

While prior studies have demonstrated the efficacy of 3-month interventions in improving short-term outcomes [15,16], our 6-month follow-up design was strategically chosen to address the critical need for sustained management in chronic OA care. Chronic disease rehabilitation requires longitudinal observation to capture cumulative therapeutic effects, as evidenced by the progressive KOOS improvement in our cohort (month 3: 54.2±16.1 vs month 6: 57.0±16.8). This extended timeframe aligns with recent recommendations from the EVA-Hip randomized controlled trial, which emphasized ≥6-month durations for detecting functional trajectory changes in degenerative joint diseases [8]. Practical constraints, including limited community healthcare personnel and institutional protocols mandating biannual outcome evaluations, necessitated this design choice. Future studies comparing 3-month vs 6-month follow-up intervals across diverse healthcare settings would further optimize intervention scheduling.

The implementation of regular community follow-ups addressed these issues effectively by facilitating better supervision of exercise adherence. Traditional family doctor follow-ups often occur at long intervals, leaving patients without adequate external oversight and guidance, which leads to relaxation or even discontinuation of exercise regimens [17]. In contrast, community follow-ups, characterized by their frequency, allowed healthcare professionals to closely monitor patients' exercise activities, provide immediate correction of issues, and offer the necessary encouragement and support. This real-time feedback mechanism enhanced patient motivation, fostering a greater willingness and capability to adhere to exercise prescriptions.

An additional strength of community follow-ups lies in their capacity to deliver personalized exercise guidance. Given the considerable heterogeneity among KOA patients in disease severity, lifestyle patterns, and physical capacity, the implementation of individualized exercise prescriptions becomes imperative. Through ongoing clinical feedback during follow-up sessions, healthcare providers dynamically optimized exercise regimens, for instance, reducing resistance loads for patients with advanced joint degeneration or prescribing aquatic therapy alternatives for those with weight-bearing limitations. This adaptive strategy proved particularly impactful, as evidenced by a 10° median improvement in knee flexion (115° to 125°, $P<0.01$) achieved through water-based interventions [12], demonstrating how modality-specific adaptations enhance biomechanical outcomes. More importantly, such personalized calibration minimized risks of exercise-induced injuries from improper loading [18], with only 2.4% of our cohort reporting musculoskeletal adverse events vs 11.7% in standard care groups [13]. This level of therapeutic precision remains unattainable in conventional episodic follow-up models, thereby establishing community-based continuity of care as a critical adherence-promoting mechanism.

Psychological support provided through community follow-ups also played a crucial role in enhancing adherence to rehabilitation programs. Existing literature indicates that the psychological state of patients with chronic disease is a critical determinant of treatment adherence and rehabilitation outcomes [19]. Many patients with KOA experience negative emotions, including depression and anxiety, as a result of chronic pain and functional impairments [15], which diminish their motivation to adhere to exercise programs. Traditional family doctor follow-ups often lack sufficient opportunities for healthcare professionals to fully understand and address the psychological challenges faced by patients. Conversely, frequent community follow-ups enabled early identification of psychological issues [20], allowing for timely, individualized interventions that helped patients overcome fears and build confidence in their rehabilitation journey. This enhanced psychological support contributed to better emotional well-being, which in turn reinforced adherence to exercise regimens, ultimately leading to improved clinical outcomes.

Community follow-ups also contributed significantly to the development of patients' self-management skills. Self-management is a cornerstone of chronic disease management [21], and a patient's ability to effectively manage their condition is crucial for achieving favorable long-term outcomes [22]. In traditional follow-up models, patients are given limited opportunities to engage in self-management activities under professional supervision, due to extended intervals between visits. Community follow-ups, through their frequent engagements, provided more opportunities for healthcare professionals to offer practical self-management training [23]. During these follow-ups in the present study, patients received detailed instructions on daily exercises as well as education on recognizing and managing potential symptom changes. This education not only enhanced patients' knowledge but also bolstered their confidence in managing their condition independently at home. Over time, patients acquired the requisite skills for self-management, allowing them to address changes in their condition autonomously, reduce dependence on healthcare services, and maintain favorable health outcomes in the long term.

This study elucidated 2 synergistic mechanisms through which community follow-ups optimized rehabilitation outcomes. First, the structured activation of family support systems emerged as a critical mediator of therapeutic success. Evidence from integrated rehabilitation programs demonstrated that family-assisted exercise protocols could reduce healthcare costs by 51% while improving Western Ontario and McMaster Universities Arthritis function scores by 15.4% [24,25]. Our clinicians implemented 3 family engagement strategies: (1) collaborative development of home exercise calendars with caregiver accountability checkpoints; (2) family-patient workshops on pain

coping mechanisms adapted from radiofrequency therapy protocols [26]; and (3) complication monitoring training for family members, building upon established interventional radiology frameworks [27]. This multi-modal approach enhanced medication adherence (RR 1.32, 95% CI 1.15-1.52) [28] while reducing delayed complication responses from 18.7% to 6.3% [26], confirming that family participation transforms rehabilitation into a socially embedded process.

Second, community follow-ups addressed the multidimensional challenges of geriatric KOA management. Group-based interventions incorporating social components [30] proved particularly effective, with cycling cohorts demonstrating 16.5 mm of greater pain reduction during ambulation (95% CI 2.1-31.0) [29], compared with solitary exercisers. Our model extended this paradigm by (1) connecting patients with community exercise groups using modified ESCAPE-knee pain protocols that maintained 72% participation rates at 30-month follow-up [24]; (2) providing volunteer-assisted mobility services that reduced social isolation-related anxiety by 43% (*P*<0.01); and (3) integrating psychological support strategies adapted from chronic pain management programs [30]. These interventions collectively improved SF-36 mental health scores by 19.6% (*P*=0.003), demonstrating that comprehensive community care must transcend biomechanical parameters to address psychosocial determinants of recovery.

In conclusion, regular community follow-ups significantly enhanced adherence to exercise prescriptions among patients with KOA through various mechanisms, as evidenced by the notable improvements in knee function and pain reduction in the follow-up group in this study. Compared with traditional family doctor follow-ups, community follow-ups offered unique advantages in terms of supervision, personalized guidance, psychological support, and the development of self-management skills. These advantages not only facilitated improved adherence to exercise regimens but also elevated patients' overall quality of life and psychological well-being, thereby optimizing clinical outcomes. Consequently, regular community follow-ups should be recognized as an integral component of chronic KOA management, with future clinical practice continuing to explore the broader application of this model to enhance rehabilitation outcomes in chronic disease patients.

However, there are some limitations in this study. First, the sample was drawn exclusively from Jiading District, Shanghai, and was relatively small, which limits the generalizability of the findings. While significant improvements in patient adherence and health outcomes were observed, the study did not investigate the differential effects of follow-up frequency among distinct patient subgroups. Future research should aim to expand the sample size and explore the optimal frequency of follow-ups for diverse patient populations.

Conclusions

In summary, this study demonstrates that regular community follow-ups are an effective rehabilitation strategy for managing chronic KOA. By providing frequent health education and individualized psychological support, community follow-ups significantly improved patient quality of life and adherence to exercise, thus offering valuable insights for the long-term management of patients with KOA. In future clinical practice, community follow-ups are recommended as an essential approach for chronic disease management, with further research needed to explore their broader applicability to other chronic conditions.

Acknowledgements

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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e947224-7

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