

Reasons for medication non-adherence among elderly patients with osteoporotic fractures: A qualitative study using the COM-B model

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Abstract

Aim(s): Medication non-adherence in elderly osteoporotic fracture (OPF) patients is 43–64%, yet existing evidence is mainly quantitative. This qualitative study aimed to explore the barriers to medication non-adherence in elderly patients with osteoporotic fractures.

Methods: Participants were recruited from a hospital in Beijing between February and March 2026 through purposive sampling. This qualitative descriptive study collected data using COM-B guided semi-structured interviews and analysed the data with Colaizzi's seven-step analysis method.

Results: Following the principle of data saturation, 15 participants were included. Three main themes emerged from the COM-B model, with ten sub-themes identified: Capability (physical capability limitations, illness-related cognitive bias and medication-related cognitive bias); Opportunity (economic burden, time and transportation constraints, insufficient healthcare system support and weak social network support); and Motivation (imperceptible treatment outcomes, low priority and negative emotions).

Conclusions: Non-adherence arises from interactive barriers across the domains of capability, opportunity, and motivation. Effective interventions should correct pain-driven medication beliefs, strengthen family and community social support systems, and establish regular BMD monitoring to provide feedback on treatment effects thereby improving adherence and in turn preventing re-fracture.

1 Introduction

Osteoporotic fracture (OPF) happens when low-energy trauma from a fall at standing height or lower causes a fracture. This results from decreased bone strength and increased bone fragility¹. The World Health Organization defines older adults in developing countries as those aged 60 years or older². As the population ages, the number of elderly patients with OPF rises worldwide³. This disease brings high rates of disability and mortality. After a first fracture, the risk of re-fracture is 17.8%^{4,5}. OPF has become a serious public health issue⁶. Medication is central to preventing and treating osteoporotic fractures⁷. Regular medication can greatly reduce the risk of re-fracture⁸. In practice, medication adherence among elderly OPF patients remains poor. Non-adherence rates are as high as 43–64%, and these increase over time^{9–11}. Elderly patients often face complex issues, including multimorbidity, cognitive decline, and polypharmacy. These factors make medication management more challenging than for other groups¹².

Multiple factors influence medication adherence in elderly OPF patients. At the patient level, cognition and physical condition are key. Most elderly patients do not know enough about the disease. They often think osteoporosis is a normal part of aging¹³. As a result, they may believe a fracture is accidental and does not require long-term medication. Many refuse treatment or stop medication soon after starting it. Physically, patients with multimorbidity showed about 12% lower adherence than others¹⁴. Smokers and heavy drinkers showed approximately 50% lower adherence¹⁵. Adverse drug reactions (43.8%) and the

fear of such reactions (23.3%) can also increase discontinuation rates¹⁶. Dosing frequency matters as well. Adherence for daily dosing was 12.2% lower than monthly dosing¹⁷. Compared with oral bisphosphonates, denosumab injections improved adherence by 1.3 to 6.8 times¹⁸. Additionally, some patients lacked belief in the need for medication or its effectiveness¹⁹. This reason accounted for a discontinuation rate of 15.8%¹⁶, making it another important factor in poor adherence. Regarding follow-up, high-quality medical communication can also improve patient medication adherence. The Fracture Liaison Service (FLS) increased adherence rates by 21.5%²⁰. A collaborative model with pharmacists and nurses improved denosumab adherence to 94%, compared to traditional community pharmacy dispensing²¹.

In summary, existing studies have largely focused on the quantitative effects of patient cognition, medication interventions, and systematic follow-up on adherence. Although these studies can identify related factors, they struggle to deeply reveal the internal logic of patients' non-adherent behavior. There is a lack of qualitative research from the patient's subjective perspective. The deep reasons behind the behavior remain underexplored. To fill this gap, a systematic theoretical framework is needed. Research has shown that using a theoretical framework is most effective for understanding behavior. The Capability, Opportunity, Motivation-Behaviour (COM-B) model is one such recommended approach²². The model conceptualizes a specific behavior of a particular population as a "behavioral system". Its core components are capability (an individual's psychological and physical capacity), opportunity (external factors outside the individual's control), and motivation (the psychological processes that drive and direct behavior)²². The COM-B model has been widely applied in areas such as chronic disease self-management and medication adherence. However, no study has yet used the COM-B model to systematically analyze medication non-adherence in elderly OPF patients. Therefore, this study adopts a qualitative research approach. It will use in-depth interviews and take the COM-B model as its theoretical framework to thoroughly explore the reasons for medication non-adherence in elderly OPF patients. This will provide a theoretical basis for developing targeted intervention strategies in clinical practice.

2 Method

2.1 Design

This study used a qualitative research design. It aims to explore the factors influencing poor medication adherence in elderly patients with osteoporotic fractures²³. Poor medication adherence is one of the core challenges faced by elderly patients with osteoporotic fractures. We used a combination of participatory observation and semi-structured interviews. This approach allowed us to obtain diverse information from participants. This method has two main advantages. First, it allows us to observe patients' behaviors from an external perspective. Second, it helps us deeply understand their internal motivations. In this way, we capture both objective facts and subjective meanings. We conducted this study in Beijing, China. We followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist²⁴.

2.2 Participants

We used purposive sampling to recruit participants. Participants were elderly patients with confirmed osteoporotic fractures who were admitted to the spinal surgery department of a hospital. The inclusion criteria were as follows: (1) medically diagnosed with osteoporotic fracture; (2) aged 60 years or older; (3) adequate understanding and communication ability; (4) voluntarily agreed to participate in this study. The exclusion criteria were as follows: (1) presence of cognitive impairment, communication difficulties, or other factors that made it impossible to cooperate; (2) refusal to participate. Sample size was determined by the principle of thematic saturation. In total, 15 patients participated in the interviews. Data collection continued until thematic saturation was reached, meaning that no new themes emerged during the last three consecutive interviews²⁵. No one withdrew from the study. All participants completed the research.

2.3 Data collection

The participatory observation and semi-structured interviews were conducted from February to March 2026. The research team reviewed relevant literature. The topic was predetermined. Using the COM-B model²⁶, we discussed and drafted an initial interview guide (Additional file 1). This interview guide was developed by our research team specifically for the present study based on the COM-B model and a review of the relevant literature, and has not been published previously. We also consulted experts in the field. They reviewed and refined the content of the interview guide. The purpose was to analyze the reasons for poor medication adherence among Chinese patients with osteoporosis. The content and clarity of the interview guide were satisfactory. Therefore, we made no changes. Before starting the study, we selected a quiet, undisturbed meeting room for the interviews. Only the interviewer and the participant were present to ensure no interruptions. We communicated face-to-face. We built trust with patients in advance. We explained the purpose of the interview and obtained signed informed consent. Each interview was audio-recorded and lasted about 30 to 45 minutes. We observed patients' non-verbal cues throughout the process and took field notes immediately after each interview. Participants could withdraw at any time during the interview. If they felt unwell, the interview could be conducted in separate sessions. All interviews were conducted by two female clinical nurses who had received training in interview techniques. Both nurses had a professional background in caring for patients with osteoporotic fractures and had experience in qualitative research. Data collection continued until thematic saturation was reached, meaning that no new themes emerged during the last three consecutive interviews.

2.4 Data analysis

Data collection and data analysis proceeded simultaneously. Two researchers (Author A & Author B) listened to the interview recordings repeatedly, then verbatim recorded and transcribed the content. All transcriptions were imported into NVivo14 software for data management and analysis²⁷. We used Colaizzi's seven-step analysis method^{28,29} to analyze the interview data³⁰. The specific steps were as follows: First, read all interview transcripts carefully. Second, extract key statements related to

medication adherence in OPF patients. Third, formulate meanings from the extracted key statements and phrases. Fourth, cluster the formulated meanings into themes. Fifth, the team integrated the findings to produce a comprehensive description of disease perceptions and factors influencing medication adherence in fragility fracture patients. Sixth, the team distilled and articulated the fundamental structure of this phenomenon. Seventh, return the analysis results to participants for validation. During implementation, two coders (Author A and Author B) independently assessed the themes. When disagreements occurred, a third person (Author C) reviewed the discrepancies. Finally, we mapped each theme into the most fitting category based on the COM-B model dimensions²². The final analysis conclusions were compiled and presented to all co-authors. They were then jointly reviewed with the research team (Table 1).

Table 1
Examples of Mapping the sub-themes to the COM-B Model

Theoretical domain	Sub-theme	Coding	Meaning unit
Capability (Psychological Capability)	Cognitive biases regarding osteoporotic fractures	Perception of osteoporosis as a natural aging phenomenon	What is your understanding of osteoporosis as a disease?
		Pain-driven treatment adherence	Do you feel that osteoporosis impacts your daily life?
Opportunity (Social Opportunity)	Social opportunity deficits (in the context of adherence)	Inadequate healthcare system support	During your visits, does the doctor explain in detail what you should pay attention to regarding your condition, apart from prescribing medication?
		Insufficient community attention to osteoporosis	Has your community organized any lectures or free screenings for osteoporosis?
Motivation (reflective motivation)	Poor reflective motivation(in the context of adherence)	Unremarkable clinical outcome	After taking the medicine, do you notice any changes in your body?

2.5 Ethical considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and the Dutch Code of Conduct for Scientific Integrity³¹.

3 Results

3.1 Participants characteristics

We interviewed 15 patients from the orthopedic department of a tertiary hospital in Beijing, China. Eleven participants (73%) were female. The mean age of all participants was 74.2 years. Thirteen patients (87%) lived in urban areas. Three participants (20%) had a college degree or higher. Five participants (33.33%) had a high school education. Two participants (13.33%) had osteoporosis for ≥ 20 years, four (27%) for ≥ 10 years, and eight (53%) were receiving anti-osteoporosis medication. Table 2 summarizes the participant characteristics.

Table 2
Participant characteristics

Characteristic	Category	No. of participants (%)
Sex	Male	4 (27.0)
	Female	11 (73.0)
Age (mean, range)		74 (60–91)
Duration of osteoporosis (mean, range)		8 (1–30)
Marital status	Married	10 (66.7)
	Widowed	4 (26.7)
	Divorced	1 (6.7)
Education	College	3 (20.0)
	High school	5 (33.3)
	Below high school	7 (46.7)
Taken medication	Caltrate D	15 (100.0)
	Calcitriol	6 (40.0)
	Calcitonin	4 (26.7)
	Denosumab	4 (26.7)
	Teriparatide	1 (6.7)
Monthly income	≤ 1000 Yuan	3 (20.0)
	1000–3000 Yuan	2 (13.3)
	3000–5000 Yuan	2 (13.3)
	≥ 5000 Yuan	8 (53.3)

3.2 Qualitative findings

This study used the COM-B model to analyze the reasons for poor medication adherence in elderly osteoporosis patients across three domains: capability, opportunity, and motivation (Fig. 1). We got 10

key barriers. The following sections describe the specific findings for each barrier. We also provide representative quotes from participants as examples.

3.3 Capability Limitations: Insufficient disease and medication knowledge, and poor self-management ability among osteoporosis patients

3.3.1 Physical capability limitations

Declining physical mobility

Osteoporosis itself, along with its comorbid conditions (such as lumbar disc herniation) or post-surgical status, severely limited patients' physical mobility. Limited mobility directly made them unable to independently complete basic management tasks, such as visiting a doctor or purchasing medication. This mobility restriction caused patients to fear going out for medical visits. It objectively cut off the physical access to obtaining medication.

"I'm afraid to walk too much."(P6)

"I can't walk on this foot." (P9)

Decline in memory function

Age-related cognitive decline, especially memory loss, was a direct cause of missed or incorrect doses³². In addition, patients faced significant difficulties managing multiple medications. When osteoporosis drugs were mixed with other long-term medications, confusion and forgetting occurred more easily, which directly disrupted the implementation of their medication schedule.

"I have to take my blood pressure meds at night too. With so many meds a day, I can't remember which one to take."(P2)

3.3.2 Poor psychological capability

Illness-related cognitive bias

Perception of disease as a natural phenomenon

Most patients simply equated osteoporosis with an unavoidable natural aging process. This made them believe that treatment was futile, which weakened their motivation to take medication.

"People think that getting older is just unavoidable. It's normal."(P4)

"I think (osteoporosis) is just caused by getting older. I've never taken it seriously."(P15)

Pain-driven treatment

Patients' medication-taking behavior was linked to the symptom of pain. Some patients reported that they only took medication when they felt pain or experienced a fracture. When they were free of pain, they immediately stopped treatment.

"If it doesn't affect eating or drinking, it's a minor illness; if it affects eating or drinking, it's a major illness. For a major illness, you should take your medicine properly; for a minor illness, you can put it aside."(P13)

"If we don't feel pain anymore, we don't treat it either."(P14)

Perceiving that the disease does not affect daily life

Because osteoporosis often causes no pain or discomfort in its early stages, patients severely underestimated its potential harm. Three patients did not realize the seriousness of the disease until they suffered a severe fracture. Even after a fracture occurred, when the pain subsided, patients forgot to take their medication again. This is a classic case of "healed wounds and forgotten pain"

"I know all about osteoporosis, but it's just healed wounds and forgotten pain."(P2)

"If it doesn't interfere with my life, I don't pay attention to it either."(P15)

Medication-related cognitive bias

Unclear about how to take medication

Patients had doubts about the most basic medication-taking procedures.

"I don't even know exactly how many pills to take a day."(P1)

"I don't know how much of which medicine to take, or for how long."(P6)

Difficulty managing polypharmacy

Patients reported that they needed to take multiple medications at the same time (such as antihypertensives and heart medications). This made them prone to confusion and forgetting.

"At my age, taking so many pills, such a big pile, and needing to take Chinese and Western medicine separately. It feels a bit complicated."(P4)

Medication adverse drug reactions

Some patients experienced discomfort while taking medication, such as kidney stones, stomach discomfort, constipation, and liver or kidney damage. Because they worried about adverse adverse drug reactions, they often stopped taking medication on their own.

"I'm a bit worried that taking too much calcium might eventually lead to kidney stones, so I don't dare to take it."(P4)

"Taking painkillers can cause liver problems for me, and I'm afraid this medicine (anti-osteoporosis medication) might have the same effect."(P1)

"When I take it, I feel a bit of stomach discomfort and constipation."(P6)

Viewing medication as a dietary supplement

Some patients viewed anti-osteoporosis treatment as a bone health process. They equated anti-osteoporosis medications with dietary supplements. Compared with medications, they preferred taking dietary supplements.

"I prefer to take dietary supplements."(P11)

"I've switched from medicine to dietary supplements, and now I only take dietary supplements."(P14)

Uncertainty about how to evaluate treatment efficacy

When asked whether they knew about bone mineral density (BMD), most patients answered that they had only heard of it or had it tested during hospitalization. After discharge, they never had BMD or other tests rechecked. Consequently, they were unable to assess the effectiveness of their medication after leaving the hospital.

I've heard of it(bone mineral density test), it's for measuring osteoporosis, but I've never had one.(P8)

"I didn't go for another follow-up. I felt that I could walk normally, so I didn't get rechecked."(P4)

Underestimating the long-term need for treatment

Most osteoporosis medications require continuous use. However, patients generally expected a "short-term cure" rather than "long-term management" for osteoporosis. This underestimation of the long-term nature of medication often led patients to stop taking it prematurely.

"I hope that one day my condition will get better, that I'll take fewer and fewer pills, and that one day this disease will be cured."(P8)

"I didn't know that this disease requires long-term medication to see effects."(P9)

3.4 Opportunity Deficits: Inadequate external support and environmental resources for osteoporosis patients

3.4.1 Restricted Physical Opportunities

Economic burden

The long-term nature of anti-osteoporosis treatment determines the cumulative economic cost for patients. Some patients clearly stated that high medication costs caused them sustained anxiety and economic burden.

"There is also the cost, after all. Some medicines cost several thousand yuan a month to take, and our family just doesn't have that kind of money. "(P10)

"All medicines are expensive at the hospital, so it's better not to take them. They are too expensive."(P11)

Time and transportation constraints

Time limitations

Patients' health management behaviors were embedded in their busy daily lives. Because they had family caregiving responsibilities or work pressure, they could not set aside time for their own health.

"The main thing is that I don't have time to take care of myself, so naturally I just don't take it."(P8)

"I have elderly parents and young children to look after, and I have to work, plus all the little trivial things in life. How can I have time to think about anything else? "(P11)

Inconvenient transportation

Elderly patients had difficulty moving around. High transportation costs and complicated travel routes further hindered their ability to go out for treatment.

"If I want to go to the hospital, I have to take a long-distance taxi. Not to mention the cost, I also don't know how to find a taxi." (P2)

"At our age, I find it a bit difficult to always be on the way to the hospital. " (P4)

3.4.2 Lack of social opportunities

Insufficient healthcare system support

Lack of detailed health education content

Patients stated that they could not fully understand the medical advice provided by doctors. After discharge, they still knew nothing about how to prevent fractures or how to take medication.

"Neither hospital said anything about what I need to pay attention to."(P10)

"I don't know which ones to take, how much to take, or for how long. "(P6)

Health education delivery is not adapted for older adults

The majority of patients clearly stated that they found it difficult to accept the current health education methods. These methods relied mainly on written materials.

"I don't like reading text on a phone. I can't remember it. "(P10)

"I have a bit of cataracts, so I prefer to listen with my ears. I'm not willing to read those brochures either. "(P11)

Osteoporosis is downplayed in other medical departments

During diagnosis and treatment, patients often had multiple diseases. They visited different hospitals and different departments for medical care. During diagnosis and treatment, patients often had multiple diseases. They visited different hospitals and different departments for medical care.

"While I was being treated for diabetes, I also wanted to look into this (osteoporosis) disease, but as soon as I got to Hospital A, the focus shifted to diabetes. " (P3)

"When I was in the hospital with pneumonia before, I stopped taking the (anti-osteoporosis) medication and only treated the pneumonia. After I came back, I didn't resume taking the medicine either. "(P14)

Weak social network support

Lack of supervision and reminders

Some patients largely relied on their children for reminders to purchase and take medication. Once their children forgot about it, they did not continue taking medication.

"My children are busy and not around, no one reminds me, so I forget."(P2)

"It's always like this: if the children buy it, I take it; if they don't buy it, I don't really buy it either, then I don't take it."(P11)

Absence of peer communication

Most patients reported a lack of communication and interaction with fellow patients during clinic visits and in daily life.

"I don't know any other patients. After the outpatient appointment, I just leave. I haven't talked with anyone else about this (osteoporosis) matter."(P11)

"I'm not really sure whether people around me have osteoporosis, and I don't really talk with them about these things."(P15)

Insufficient community attention

The community is the most accessible health service setting for elderly patients. However, its absence in osteoporosis prevention and control was particularly prominent. Most patients clearly stated that the community had never organized any related lectures or awareness campaigns.

"The community hasn't organized any activities on this (osteoporosis) topic." (P9)

3.5 Motivation Deficits: Low priority given to osteoporosis treatment and weak intrinsic motivation among patients

3.5.1 Weak reflective motivation

Imperceptible treatment outcomes

Patients' adherence to medication depended largely on their direct perception of treatment efficacy. Most patients reported that they did not feel the expected physical improvement after taking medication. Some even experienced new fractures. The occurrence of a fracture while on medication made them question the drug's effectiveness. Consequently, they discontinued treatment.

"I haven't felt any effect from using it. It still hurts." (P1)

"I've taken it for seven or eight years, but I still had fractures while taking it." (P14)

Osteoporosis is given low priority

Some patients clearly stated that, compared with other chronic diseases such as hypertension and diabetes, they considered osteoporosis to be less harmful and less urgent. As a result, it was often given lower priority in their health management.

"Blood pressure medicine has to be taken every day. This (osteoporosis medication) can be taken or not." (P12)

"Of course, diabetes is more important. Diabetes affects the legs, kidneys, and eyes. Not taking this (osteoporosis medication) certainly won't affect those." (P15)

3.5.2 Automatic motivation dominant

Negative emotions

Patients expressed a strong sense of guilt about being a burden to their families.

"I feel that my poor health is a burden; the psychological pressure is quite heavy." (P11)

"Quite a few big things have happened in my life this year. I feel I've been a burden to my children, and I don't want to cause them trouble." (P8)

4 Discussion

Elderly patients with osteoporosis had a higher risk of future major fractures. The risk was approximately 2.43 to 2.73 times higher compared with those without osteoporosis³³. Although patients knew they had a high risk of fracture and that medication was necessary, their treatment adherence was only 36% to 57%⁹⁻¹¹. Within one year after starting treatment, about two-thirds of patients continued taking medication on their own. However, as age increased, the proportion of those who persisted long-term dropped to below 30%³⁴. The reasons for poor adherence are underexplored. Based on the COM-B model²², this study discusses these reasons from three dimensions: capability, opportunity, and motivation.

At the capability level, the fundamental barrier to medication adherence lies in psychological capability. Patients lack accurate knowledge about their disease and its treatment. They view osteoporotic fractures as a normal part of aging. Clinical observations showed that patients often form a fixed causal link between osteoporotic fractures and pain. They believe a fracture is necessarily accompanied by significant pain³⁵. Conversely, they think no pain means no fracture. Or they think the fracture has healed. Then medication is no longer needed. Thus, the absence of pain is a major barrier to treatment³⁶. This cognitive bias directly leads patients to take medication only when pain occurs. Consequently, they stop taking medication on their own when pain is relieved or absent. Over time, even after a fracture heals, patients often stop medication due to symptom relief. This ultimately leads to a continuous decline in medication adherence and poor outcomes. Research shows interrupting drug therapy increases the risk of osteoporotic fractures by 20% to 45%³⁷. On the other hand, medication can cause adverse drug reactions such as stomach pain and constipation. These reactions intensify their refusal to take medication³⁸. Moreover, patients are reluctant to take any medication at all. They stop their medication and switch to dietary supplements, which they consider optional. This perception of medication as non-essential further weakens their persistence with prescribed drugs³⁹.

Physical capability limitations directly hinder the execution of treatment behaviors. Research showed that patients' mobility is significantly reduced due to factors such as comorbidities, post-surgical recovery needs, or physiological decline. This makes basic treatment steps like visiting a doctor or purchasing medication particularly difficult⁴⁰. At the same time, common memory decline and the challenge of managing multiple medications make simple on-time dosing difficult to achieve in daily life⁴¹. This easily leads to treatment discontinuation due to forgetting or confusion. These physiological limitations are objective barriers that are difficult for patients to overcome through personal effort. They are particularly prominent in the very old and those with multimorbidity⁴², and thus have a persistent negative impact on medication adherence.

In addition to capability barriers, opportunity barriers further affect medication adherence in osteoporosis patients. Opportunity barriers include both physical and social aspects. The physical barrier is mainly economic burden. Research shows that in populations with high economic pressure,

such as low-income households, patient treatment adherence drops by as much as 30% to 40% ⁴³. The lack of social opportunity has a broader and deeper impact. On one hand, doctor education is vague, poorly adapted to elderly patients, and insufficiently in-depth. On the other hand, cross-departmental care and societal attention to osteoporosis are low. Studies find that clinical health education for osteoporosis is clearly insufficient. The educational content is not detailed, and there is a general lack of specialized health education materials for older adults. This makes it difficult for elderly patients to obtain targeted information ⁴⁴. In addition, osteoporosis treatment is downplayed in other departments. For example, when patients are hospitalized in internal medicine for other diseases, their anti-osteoporosis treatment is interrupted and not resumed later. This interruption occurs because patients think osteoporosis does not affect the treatment ⁴⁵. Such practice sends patients the wrong signal that osteoporosis is not important. At the same time, the current specialization of medicine often leads to care that is delivered within individual departments. There is a lack of systematic assessment and comprehensive management of patients' overall health ⁴⁶. Furthermore, surveys show that patients' family and community social systems have significant shortcomings. Communities fail to effectively carry out osteoporosis-related education. This results in patients having a severely insufficient understanding of the importance of treatment ⁴⁷.

The capability and opportunity barriers described above further inhibit motivation for medication adherence in osteoporosis patients. As a result, patients perceive osteoporosis treatment as having lower priority than other diseases. Doctors also place osteoporosis as a secondary priority when managing multiple diseases ⁴⁸. Second, patients often rely on subjective feelings to judge the effectiveness of drug therapy. When pain does not improve after taking medication, they easily develop a belief that the drug is ineffective, leading them to reduce the dose or stop treatment on their own ⁴⁹. In fact, many patients do not know whether osteoporosis has ameliorated ⁵⁰. The core indicators for clinically assessing osteoporosis treatment effectiveness are BMD ⁵¹. However, small changes in these objective indicators are difficult for patients to perceive. Due to the lack of direct positive feedback, patients' motivation to take medication decreases significantly ⁵². Studies show that patients who receive BMD testing during treatment have an average 22% higher medication adherence ⁵³. This suggests that regular BMD monitoring may provide necessary feedback on treatment effectiveness, thereby improving medication-taking behavior. Furthermore, negative beliefs and attitudes can profoundly influence patients' medication adherence behavior ⁵⁴. The guilt of being a burden to family members, which emerged in this study, is a strong negative emotion.

The COM-B model emphasizes that behavior change requires coordinated efforts targeting capability, opportunity, and motivation, rather than single-dimension interventions. Based on the findings of this study, we propose the following directions for intervention strategies. At the capability level, to address the cognitive bias of "no pain, no disease," we should design easy-to-understand health education materials. These materials help patients develop a scientific understanding of treatment effectiveness. At the opportunity level, we should increase social attention and policy support for medical care of low-

income populations. We should extend osteoporosis management from specialists to general practitioners. Community screening and education should be carried out to break down information barriers. Family participation should be strengthened by incorporating medication supervision and emotional support into the care system. At the motivation level, we should enhance non-specialist physicians' attention to osteoporosis through continuing education. A system of regular BMD follow-up and result feedback should be established to enable patients to perceive objective treatment effects. At the same time, we should understand patients' psychological experiences and transform negative emotions into motivation for treatment. This is a necessary pathway to address common challenges in chronic disease management.

5 Conclusion

Based on the COM-B model, this study systematically analyzed the reasons for medication non-adherence in elderly patients with osteoporotic fractures from three aspects: capability, opportunity, and motivation. At the capability level, patients had cognitive biases about the disease and medication, and were also limited by physical function. At the opportunity level, economic burden, transportation barriers, inadequate health education, and weak social support together formed external obstacles. At the motivation level, imperceptible treatment outcomes, low priority of osteoporosis, and negative emotions weakened their willingness to take medication. This study applied the COM-B model in a qualitative analysis of this population, addressing the limitations of previous quantitative research. It identified intervention strategies such as correcting cognitive biases, strengthening social support, and establishing regular BMD feedback mechanisms. These provided a theoretical basis for clinical nursing to improve long-term medication adherence. This study has several limitations. First, the sample came from a single tertiary hospital and was predominantly urban residents (87%). This limits the generalizability of the findings. Second, this study used a cross-sectional study design and did not track the dynamic changes in patients' medication behavior over time. Future research should expand the sample to include rural areas and combine longitudinal qualitative research design or mixed-method designs to further explore the evolution of influencing factors.

Declarations

Clinical trial number

Not applicable.

Ethics approval and consent to participate

The present study has been approved by the Ethics Review Board of the China-Japan Friendship Hospital (Approval No. 2026-KY-077, dated February 14, 2026). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research

committee and the 1964 Helsinki Declaration and its later amendments, or with comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable. This manuscript does not contain any individual person's data (such as personal details, images, or videos) that would require specific consent for publication.

Competing interests

The authors declare no competing interests.

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Author Contribution

XueYing Zhang: Conceptualization, Investigation, Project administration, Supervision, Writing – original draft.YuFeng Liang: Conceptualization, Data curation, Investigation, Writing – original draft.XiaoJun Wang: Data curation.Miao Yu: Investigation.All authors read and approved the final manuscript.

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Authors'contributions

XueYing Zhang: Conceptualization, Investigation, Project administration, Supervision, Writing – original draft.

YuFeng Liang: Conceptualization, Data curation, Investigation, Writing – original draft.

XiaoJun Wang: Data curation.

Miao Yu: Investigation.

All authors read and approved the final manuscript.

Data Availability

The qualitative data (including interview transcripts) generated during this study are not publicly available due to the sensitive nature of the information and ethical restrictions protecting participant confidentiality. De-identified data may be available from the corresponding author upon reasonable request.

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Figures

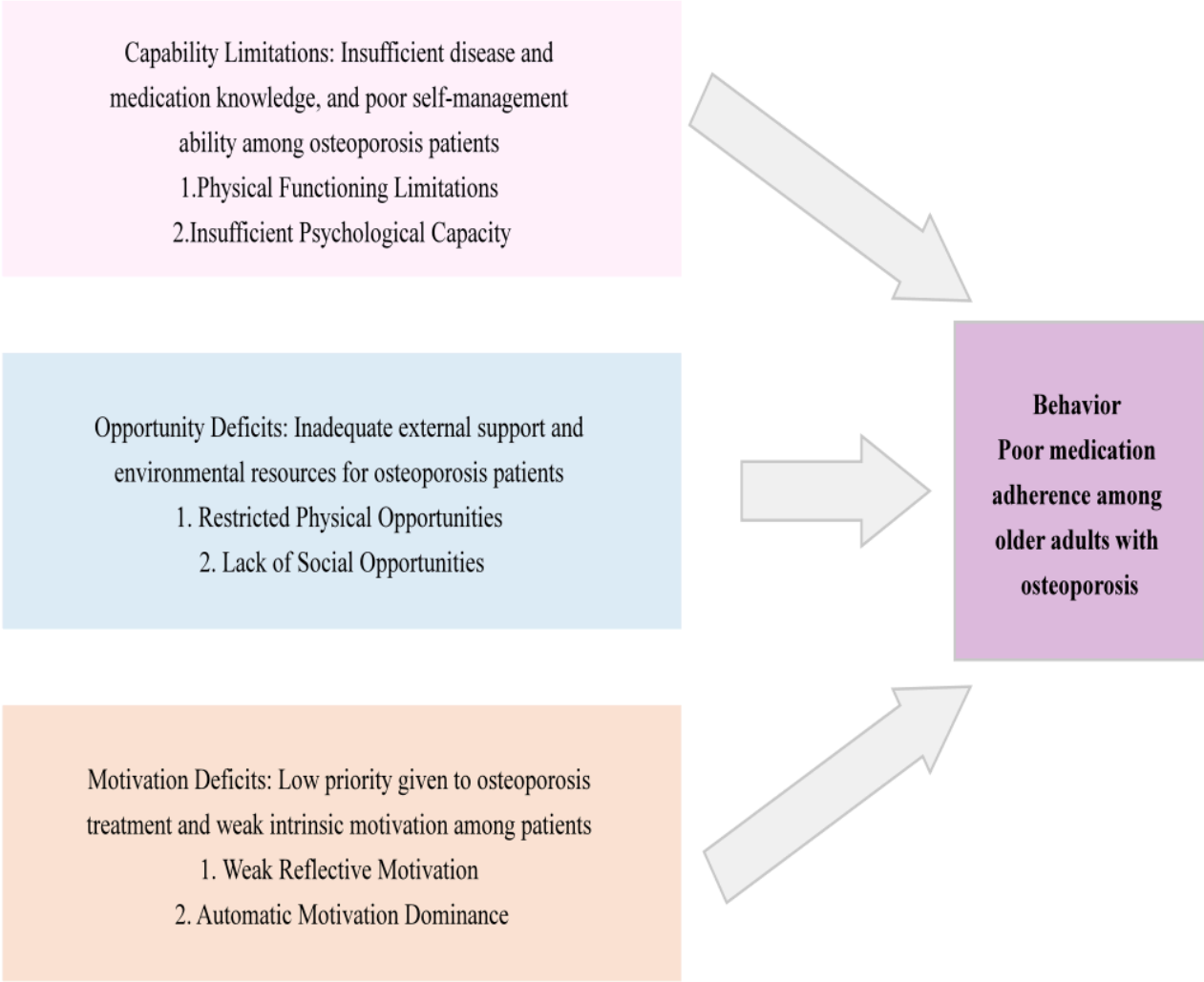


Figure 1

Barriers to medication adherence in older adults with osteoporosis based on the COM-B model

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