# Study on Influencing Factors of Lipid Management Behaviors among Primary Care General Practitioners in Tianjin Based on the COM-B Model

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## Abstract

Background China faces a severe situation in the prevention and control of dyslipidemia, and primary healthcare institutions are the main battlefield for chronic disease prevention and control. National policies have clearly emphasized strengthening lipid management at the primary care level; however, existing studies lack support from systematic models, and intervention strategies are insufficiently targeted, warranting further investigation. Objective To analyze the current status and influencing factors of lipid management behaviors among primary care general practitioners in Tianjin based on the Capability, Opportunity, Motivation-Behavior (COM-B) model, and to provide empirical evidence for developing optimization strategies. Methods Using cluster sampling, 387 on-duty clinicians from 32 primary healthcare institutions in 16 administrative districts of Tianjin were selected from March to June 2025. A four-dimensional assessment questionnaire constructed based on the COM-B model was used to collect major indicators, including demographic characteristics, lipid management capability, opportunity resources, management motivation, and lipid management practice behaviors. SPSS26.0 was used for statistical analysis. Between-group comparisons were performed using independent-samples t tests or one-way analysis of variance. Pearson correlation analysis was used to examine associations between factors in each dimension and lipid management behaviors, and multiple linear regression analysis was used to identify the main influencing factors of lipid management behaviors and to test for multicollinearity. Results The scores of primary care general practitioners in the dimensions of lipid management capability, opportunity, motivation, and behavior were $(8.04\$\pm1.96), (26.35\pm6.45), (31.50\pm6.40), and (15.96\pm3.68), respectively, with scoring rates ranging from 60 = 0.141), number of patients with dyslipidemia seen per week( = 0.148), knowledge level in the capability dimension( 0.256), ability to manage complex cases( = 0.129), and self-efficacy in the motivation dimension( = 0.294) were positively correlated with lipid management behaviors (P < 0.05). Treatment safety concerns in them$ 0.417, P<0.01). These variables collectively explained 51.8% of the behavioral variance. Indicators in the opportunity dimension were not correlated with lipid management behaviors (P>0.05). Conclusion Lipid management behaviors among primary care general practitioners in Tianjin are at a moderate level. Professional capability and self-efficacy exert positive effects, while treatment safety concerns are the primary negative factor. Targeted training, resource support, and motivational incentives are needed to improve the standardization of management and contribute to the prevention and control of cardiovascular diseases.

Full Text

Original Article

# Study on Influencing Factors of Lipid Management Behaviors among Primary Care General Practitioners in Tianjin Based on the COM-B Model

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【Abstract】 **Background** The situation of dyslipidemia prevention and control in China is severe, and primary care institutions are the main battlefield for chronic disease prevention and treatment. National policies have clearly emphasized strengthening lipid management at the primary care level; however, existing studies lack the support of systematic models, and intervention strategies are insufficiently targeted, warranting in-depth research. **Objective** To analyze the current status and influencing factors of lipid management behaviors among primary care general practitioners in Tianjin based on the Capability–Opportunity–Motivation–Behavior (COM-B) model, so as to provide empirical evidence for developing optimized strategies. **Methods** Using cluster sampling, 387 on-duty clinical physicians from 32 primary care institutions in 16 administrative districts of Tianjin were selected from March to June 2025. A four-dimensional assessment questionnaire constructed based on the COM-B model was used to conduct the survey, collecting key indicators including demographic characteristics, lipid management capability, opportunity resources, management motivation, and lipid management practice behaviors. SPSS 26.0 software was used for statistical analysis. Between-group comparisons were performed using independent-samples $t$ tests or one-way analysis of variance. Pearson correlation analysis was used to explore the associations between factors in each dimension and lipid management behaviors, and multiple linear regression analysis was

used to screen the main influencing factors of lipid management behaviors and to test for multicollinearity. **Results** The scores of primary care general practitioners in the dimensions of lipid management capability, opportunity, motivation, and behavior were (8.04 ± 1.96), (26.35 ± 6.45), (31.50 ± 6.40), and (15.96 ± 3.68) points, respectively, with score rates all between 60% and 66%. Differences in lipid management behavior scores among physicians of different sex, years of practice, professional title, and number of patients with dyslipidemia seen per week were statistically significant ($P$<0.05). Pearson correlation analysis showed that lipid management behaviors were positively correlated with factors in the capability and opportunity dimensions ($r$ values of 0.140–0.416 and 0.165–0.379, respectively; $P$<0.01); they were negatively correlated with treatment safety concerns in the motivation dimension ($r$=-0.458, $P$<0.01), and positively correlated with self-efficacy ($r$=0.190, $P$<0.01). Multiple linear regression showed that years of practice ($\beta$=0.141), number of patients with dyslipidemia seen per week ($\beta$=0.148), knowledge level in the capability dimension ($\beta$=0.256), ability to manage complex cases ($\beta$=0.129), and self-efficacy in the motivation dimension ($\beta$=0.294) were positively associated with lipid management behaviors ($P$<0.05). Treatment safety concerns in the motivation dimension were negatively associated with lipid management behaviors ($\beta$=-0.417, $P$<0.01). These variables together explained 51.8% of the variance in behaviors. Indicators in the opportunity dimension were not correlated with lipid management behaviors ($P$>0.05). **Conclusion** Lipid management behaviors among primary care general practitioners in Tianjin are at a moderate level. Professional capability and self-efficacy have positive effects on these behaviors, while treatment safety concerns are the primary negative factor. Management standardization should be improved through targeted training, resource support, and motivational incentives to assist in the prevention and control of cardiovascular diseases.

**【Keywords】** general practitioners; primary care; lipid management; COM-B model; diagnosis and treatment behavior; self-efficacy; treatment safety concerns

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# Influencing Factors of Lipid Management Behaviors among Primary Care General Practitioners in Tianjin Based on the Capability-Opportunity-Motivation-Behavior Model

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**【Abstract】 Background** The prevention and control of dyslipidemia in China face severe challenges, with primary healthcare institutions serving as the main front for chronic disease management. Although national policies have clearly emphasized strengthening lipid management at the primary level, current research lacks systematic model support and targeted intervention strategies, warranting further in-depth investigation. **Objective** To analyze the current status and influencing factors of lipid management behaviors among general practitioners in primary healthcare institutions in Tianjin based on the Capability, Opportunity, Motivation-Behavior (COM-B) model, and to provide empirical evidence for developing optimized intervention strategies. **Methods** A cluster sampling method was adopted. From March to June 2025, 387 practicing clinicians were selected from 32 primary healthcare institutions across 16 administrative districts in Tianjin. A four-dimensional assessment questionnaire based on the COM-B model was used to collect key indicators, including demographic characteristics, lipid management capability, opportunity, motivation,

and management behaviors. Statistical analysis was conducted using SPSS 26.0. Independent-samples t-tests or one-way ANOVA were used for group comparisons. Pearson correlation analysis was performed to explore associations between each dimension and lipid management behaviors. Multiple linear regression analysis was used to identify main influencing factors, and multicollinearity diagnostics were conducted. **Results** The scores for the capability, opportunity, motivation, and behavior dimensions among general practitioners were $8.04 \pm 1.96$, $26.35 \pm 6.45$, $31.50 \pm 6.40$, and $15.96 \pm 3.68$, respectively, with percentage scores ranging from 60% to 66%. Significant differences in lipid management behavior scores were observed among doctors of different genders, years of practice, professional titles, and weekly numbers of dyslipidemia patients seen ($P < 0.05$). Pearson correlation analysis showed that lipid management behavior was positively correlated with all factors in the capability and opportunity dimensions ($r = 0.140 \sim 0.416$ and $0.165 \sim 0.379$, $P < 0.01$), negatively correlated with treatment safety concerns in the motivation dimension ($r = -0.458$, $P < 0.01$), and positively correlated with self-efficacy ($r = 0.190$, $P < 0.01$). Multiple linear regression analysis indicated that years of practice ($\beta = 0.141$), number of dyslipidemia patients seen weekly ($\beta = 0.148$), knowledge level ($\beta = 0.256$), complex case management ability ($\beta = 0.129$) within the capability dimension, and self-efficacy ($\beta = 0.294$) within the motivation dimension were positively associated with lipid management behaviors ($P < 0.05$), while treatment safety concerns ($\beta = -0.417$, $P < 0.01$) within the motivation dimension were negatively associated. These variables explained 51.8% of the variance in management behaviors. Indicators in the opportunity dimension were not significantly associated with management behaviors ($P > 0.05$). **Conclusion** Lipid management behaviors among general practitioners in primary healthcare institutions in Tianjin are at a moderate level. Professional capability and self-efficacy have a positive influence on these behaviors, while concerns about treatment safety are the main negative factor. Standardization of management should be enhanced through targeted training, resource support, and motivational incentives, thereby supporting the prevention and control of cardiovascular diseases.

**【Key words】** General practitioners; Primary medical care; Lipid management; COM-B model; Clinical practice behavior; Self-efficacy; Treatment safety concerns

With the rapid development of China' s society and economy and the continuous intensification of population aging, dyslipidemia has become one of the important risk factors affecting the health of Chinese residents. In recent years, the prevalence of dyslipidemia among Chinese residents has shown an upward trend year by year, increasing from 18.6% in 2002 to 40.4% in 2012[1]. Data show that among adults aged $ $18 years in China, the awareness rate, treatment rate, and control rate of dyslipidemia are 11.7%, 10.1%, and 4.8%, respectively, indicating a severe prevention and control situation[2]. Therefore, it is necessary to further strengthen lipid management and carry out primary and secondary prevention of cardiovascular diseases. At present, primary healthcare institutions

have become the main battlefield for the prevention and treatment of chronic diseases. Improving primary-level general practitioners' awareness of dyslipidemia and their prevention and treatment capacity is of great significance for reducing the overall cardiovascular risk of the population and preventing and treating atherosclerotic cardiovascular disease (ASCVD)[3]. The *Healthy China Action—Implementation Plan for the Prevention and Control of Cardiovascular and Cerebrovascular Diseases (2023–2030)* issued in 2023[4] and the *Guiding Opinions on Strengthening Primary-Level Chronic Disease Health Management Services* issued in 2025[5] both emphasize the need to give full play to the pivotal role of primary care in chronic disease management. As the main force for first-contact care, primary-level general practitioners'standardized diagnosis and treatment capacity for dyslipidemia prevention and control, motivation, accessible opportunity resources, and actual practice behaviors directly determine the coverage and implementation effectiveness of lipid management[6].

Primary healthcare institutions in Tianjin cover 16 urban and rural administrative districts, serving a large and structurally complex population. The lipid management capacity of primary-level general practitioners is therefore more directly related to the achievement of regional cardiovascular disease prevention and control goals. However, supportive research related to lipid management at the primary level remains insufficient. Existing studies have mostly focused on descriptive analyses of the current status of primary-level lipid management —such as medication availability and knowledge awareness rates[7–10]—and lack in-depth analysis based on systematic models such as behavior change theory. As a result, the proposed intervention strategies often remain at the level of "generalized recommendations" and are difficult to align with actual primary-level needs. Therefore, based on the capability, opportunity, motivation–behavior (COM-B) model, this study systematically analyzes the current status of lipid management among primary-level general practitioners across the dimensions of capability, opportunity, motivation, and behavior, and accurately identifies influencing factors in each dimension, in order to formulate targeted, practical, and feasible

provide empirical evidence for optimizing primary-level lipid-management strategies, thereby improving the overall lipid-management capacity at the primary level and effectively preventing and controlling cardiovascular diseases.

## 1 Participants and Methods

### 1.1 Study Participants

This study was a cross-sectional study. Cluster sampling was used to select the study participants. From March to June 2025, two community health service centers/township health centers were randomly selected from each of the 16 administrative districts in Tianjin, for a total of 32 primary healthcare institutions. A questionnaire survey was conducted among all in-service clinicians in these institutions who met the inclusion and exclusion criteria. This study

was approved by the Ethics Committee of Tianjin Medical University General Hospital (Ethics approval No.: IRB2023-KY-250).

### 1.2 Inclusion and Exclusion Criteria

Inclusion criteria: (1) front-line clinicians working in community health service centers, township health centers, and other primary medical and health institutions within the jurisdiction of Tianjin; (2) engaged in primary healthcare work for $>1$ year; (3) holding a valid practicing physician qualification certificate; (4) voluntarily participating in this survey and signing an informed-consent form. Exclusion criteria: (1) having been away from front-line clinical work for $>1$ year; (2) unable to complete the questionnaire because of further study, leave, or other reasons.

### 1.3 Sample-Size Calculation

According to the sample-size calculation formula: $n = Z^2 \times p \times (1-p)/d^2$, when setting the parameters, priority was given to controlling the risk of potential bias. A response distribution of 50% ($p = 0.5$) was used to address the limitation of insufficient prior data; an allowable error of 5% ($d = 0.05$) was used to balance precision and cost; and a 95% confidence level ($Z = 1.96$) was used to ensure the reliability of the estimate. The calculated minimum total sample size was 384.

A total of 462 questionnaires were distributed in this study, and 413 were returned (response rate: 89.39%). After questionnaire collection was completed, all questionnaires were cross-checked by two reviewers to ensure that the data were nonduplicate, complete, and free of logical errors. Twenty-six invalid questionnaires were excluded, and 387 valid questionnaires were finally obtained (valid response rate: 93.70%). The criteria for identifying invalid questionnaires were as follows: (1) fewer than 5 questions answered; (2) continuous patterned responses.

### 1.4 Questionnaire Design

**1.4.1 Design of the Survey Questionnaire** Using the COM-B model as the core framework, and with reference to relevant domestic and international literature

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, the initial draft of the questionnaire on the current status of lipid diagnosis and treatment among primary care physicians was designed after in-depth discussion by 10 experts in the fields of dyslipidemia, general practice, and health administration. The questionnaire assessed four dimensions– "capability–opportunity–motivation–behavior" –with a total of 36 evaluation items. In terms of professional titles, the expert panel consisted of 6 experts with senior professional titles and 4 with associate senior professional titles; by specialty, it included 5 cardiovascular medicine experts, 3 general practice experts, and 2

experts in health administration. After the initial draft was completed, a pilot survey was conducted among 30 general practitioners at the Huayuan Community Health Service Center in Nankai District, Tianjin, and the Dazhangzhuang Community Health Service Center in Beichen District. Based on the respondents' feedback, the questionnaire items were revised to better reflect the current status of primary-level dyslipidemia diagnosis and treatment, and the final survey questionnaire was completed.

### 1.4.2 Questionnaire Content

(1) Basic demographic and occupational information, including 7 items: sex, age, educational background, years of work, type of employing institution, professional title, and weekly number of visits by patients with dyslipidemia; (2) multidimensional evaluation of lipid-management practice (36 items). According to the COM-B framework, the capability dimension comprised 13 items (4 items on knowledge level, 6 items on operational skills, and 3 items on physician–patient communication), scored dichotomously (1 point for "clearly knows/can complete according to standards," and 0 points for "does not know/cannot complete"); the opportunity dimension comprised 8 items, the motivation dimension 10 items, and the behavior dimension 5 items, all scored using a 5-point Likert scale (options were "very inconsistent," "relatively inconsistent," "average," "relatively consistent," and "very consistent," assigned 1–5 points, respectively). Among them, the item on treatment-safety considerations in the motivation dimension was reverse-scored. The total scores for the capability, opportunity, motivation, and behavior dimensions were 0–13, 8–40, 10–50, and 5–25 points, respectively. The score rate for each dimension (%) = (mean score of that dimension in the population / total score of that dimension scale) × 100%. The specific items for each dimension are shown in Table 1.

## 1.5 Survey Methods and Quality Control

A survey team was formed, and all members received 4 h of online special training (including research background, interpretation of questionnaire items, standards for informed-consent notification, and adaptation techniques for primary care settings). Only those who passed the assessment participated in the survey. Personnel were assigned according to the number and distribution density of primary healthcare institutions in the 16 administrative districts of Tianjin, ensuring that each primary healthcare institution had a designated person in charge and that the survey coverage was complete without omissions. The survey adopted the method of "online training–WeChat push–real-time Q&A." After communicating with the person in charge of the selected institution, the investigators convened the physicians and explained on site the study purpose and questionnaire-completion requirements. Exclusive links generated through "Wenjuanxing" were then pushed via WeChat work groups (each mobile phone

was allowed to answer only once, and completion was limited to 15 min), and completion status was monitored online in real time. During the data-collection stage, logic checks were set to automatically intercept invalid answers. During the data-review stage, two researchers cross-reviewed the questionnaires; questionable questionnaires (e.g., those missing 1–2 noncritical items) were supplemented by telephone follow-up. Finally, 26 invalid questionnaires were excluded according to the validity criteria. After testing, the Cronbach' s $\alpha$ coefficients for the three dimensions of opportunity, cognition, and behavior, as well as for the questionnaire as a whole, were all $> 0.7$; in validity testing, the KMO (Kaiser–Meyer–Olkin) value was $> 0.8$ (Bartlett' s test of sphericity, $P < 0.001$), indicating that the questionnaire had good reliability and structural validity.

### 1.6 Statistical Methods

SPSS 26.0 software was used for data processing and analysis. Count data were described using constituent ratios, and normally distributed measurement data were described using $(\bar{x} \pm s)$. All quantitative data approximately followed a normal distribution. Between-group comparisons were performed using the independent-samples $t$ test or one-way analysis of variance. For variables in the COM-B model, Pearson correlation analysis was used to explore the relationships between capability, opportunity, and motivation factors and lipid-management behavior. With the lipid-management behavior score as the dependent variable and demographic variables as control variables, multiple linear regression analysis was used to explore the predictive effects of COM-B-related variables on lipid-management behavior. Before multiple linear regression analysis, multicollinearity was tested; the absence of multicollinearity was determined by a variance inflation factor (VIF) $< 10$ and tolerance $> 0.1$. The significance level was $\alpha = 0.05$.

## 2 Results

**Table 1** Evaluation items of each dimension in the COM-B model for lipid management among primary care general practitioners

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Capability dimension | Knowledge level | Knows the LDL-C control target for patients at extremely high risk of ASCVD |
| Capability dimension | Knowledge level | Knows the core items of routine lipid testing at the primary care level (the four lipid measures) |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Capability dimension | Knowledge level | Knows the primary intervention target for patients with isolated hypertriglyceridemia |
| Capability dimension | Knowledge level | Knows the types of patients who can be directly classified as high-risk for ASCVD without undergoing 10-year ASCVD risk assessment |
| Capability dimension | Operational skills | Can formulate a standardized lipid monitoring plan every 6–12 months for patients whose lipids are stable after six months of statin therapy, and clarify fasting requirements |
| Capability dimension | Operational skills | Can screen for secondary factors according to the operating procedure in patients newly diagnosed with dyslipidemia |
| Capability dimension | Operational skills | Can manage elevated liver enzymes after statin therapy (2–3 times the upper limit of normal), and formulate processes for drug discontinuation, re-examination, and regimen adjustment |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Capability dimension | Operational skills | Can formulate an individualized initial statin dose and monitoring plan for older patients aged $ 75*years*, *consideringhepaticandrenalfunctionandcor* *Cmonotherapy*\|\|*Capabilitydimension*\|*Operationalskill* |
| | | 3 fatty acid drugs for patients with isolated hypertriglyceridemia |
| Capability dimension | Doctor–patient communication | When prescribing statins for patients, I will proactively inform them of common adverse reactions (such as muscle soreness and elevated liver enzymes) and ways to respond |
| Capability dimension | Doctor–patient communication | When faced with patients' concerns about "long-term statin use," I will first express understanding and then explain the necessity of treatment and the evidence of benefit |
| Capability dimension | Doctor–patient communication | When formulating a lipid management plan, I will fully ask about patients' wishes and jointly determine the intervention plan |
| Opportunity dimension | Drug supply assurance | Commonly used moderate-intensity statins at the primary care level (such as atorvastatin and rosuvastatin) are in adequate supply, with no frequent stockouts |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Opportunity dimension | Support from diagnostic and treatment facilities | The outpatient clinic can conveniently carry out the four lipid tests, and results can be fed back within the prescribed time (e.g., $ $1 working day) |
| Opportunity dimension | Support from information technology tools | Standardized lipid laboratory reports embedded with QR codes for health education are available |
| Opportunity dimension | Support from information technology tools | After patients initiate lipid-lowering therapy, the information system can automatically push a reminder for re-examination after 4–6 weeks (e.g., by text message or software notification) |
| Opportunity dimension | Support from time and processes | Sufficient time is reserved in the outpatient clinic for patients with dyslipidemia to avoid rushed communication |
| Opportunity dimension | Support from time and processes | During consultation, the patient’ s previous lipid tests, medication history, and comorbidity data can be quickly retrieved according to a fixed process |
| Opportunity dimension | Support from training and learning | Regular participation is available in specialized training that includes analysis of management approaches for complex cases (such as diabetes complicated by hyperlipidemia) |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Opportunity dimension | Support from training and learning | Targeted training in practical skills, such as the use of statins and management of adverse reactions, can be obtained (e.g., offline hands-on practice and online micro-courses) |
| Motivation dimension | Professional identity | Helping patients with dyslipidemia reduce their risk of cardiovascular disease gives me a strong sense of professional achievement |
| Motivation dimension | Goal orientation | I will proactively take "helping patients with dyslipidemia reach the guideline-recommended LDL-C control target" as the core direction of my work |
| Motivation dimension | Self-efficacy | I can accurately enter data throughout the whole process in a standardized manner, including lipid testing, medication records, and follow-up results |
| Motivation dimension | Self-efficacy | For complex lipid cases with comorbid diabetes and hypertension, I can independently formulate a safe and effective management plan |
| Motivation dimension | Self-efficacy | I can initiate and adjust statin therapy for indicated patients in strict accordance with guideline requirements. |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Motivation dimension | Self-efficacy | I can effectively improve patients' medication adherence and reduce the occurrence of self-discontinuation or dose reduction |
| Motivation dimension | Concerns about treatment safety | I am concerned that long-term use of lipid-lowering drugs in older adults may cause adverse reactions such as muscle injury. |
| Motivation dimension | Concerns about treatment safety | I have concerns about the safety of combining lipid-lowering drugs with other medications for chronic diseases, such as antihypertensive and hypoglycemic drugs |
| Motivation dimension | Concerns about treatment safety | For intensified lipid-lowering therapy in very-high-risk/high-risk patients, I worry that dose adjustment may cause safety problems |
| Motivation dimension | Concerns about treatment safety | I am concerned that patients may fail to complete the required regular monitoring after medication use (such as lipid and liver enzyme testing) because they find it troublesome or are unwilling to spend money |
| Behavior dimension | Risk stratification | When receiving patients with dyslipidemia, I will complete ASCVD risk stratification and LDL-C target setting according to guideline standards. |

| First-level dimension | Second-level dimension | Item |
|---|---|---|
| Behavior dimension | Drug therapy | For patients who require drug therapy, I will preferentially choose a moderate-intensity statin as the initial treatment |
| Behavior dimension | Comprehensive intervention | I will formulate individualized intervention plans for patients with dyslipidemia, covering both drug therapy and lifestyle guidance such as diet and exercise |
| Behavior dimension | Monitoring and follow-up | I will complete the first follow-up within 4–6 weeks after patients initiate lipid-lowering therapy and regularly monitor relevant indicators |
| Behavior dimension | Referral linkage | For patients who meet referral indications, such as LDL-C $ $4.9 mmol/L combined with high-risk factors, I can promptly initiate a standardized referral process |

Note: ASCVD = atherosclerotic cardiovascular disease.

## 2.1 Basic characteristics of the survey respondents

Among 387 primary care general practitioners, 258 were female (66.67%); 339 had a bachelor' s degree or below (87.60%); 291 physicians (75.19%) worked in urban practice institutions; 182 were aged $ $40 years (47.02%), 154 were aged 41–50 years (39.80%), and 51 were aged >50 years (13.18%); 43 had practiced medicine for $ $5 years (11.11%), 78 for 6–10 years (20.16%), 140 for 11–20 years (36.18%), and 126 for $ $21 years (32.56%); 69 were resident physicians (17.83%), 178 were attending physicians (45.99%), 110 were associate chief/chief physicians (28.43%), and 30 were other types (7.75%); regarding the number of patients with dyslipidemia seen per week, 96 physicians saw $ $10 patients

(24.81%), 236 saw 11–50 patients (60.98%), and 55 saw >50 patients (14.21%).

## 2.2 Questionnaire scores for lipid management capability, opportunity, motivation, and behavior among primary care general practitioners

The scores of 387 primary care general practitioners on the capability, opportunity, motivation, and behavior dimensions of lipid management were 8.04 ± 1.96, 26.35 ± 6.45, 31.50 ± 6.40, and 15.96 ± 3.68 points, respectively; the corresponding scoring rates were 61.88%, 65.89%, 63.13%, and 63.84%. In the capability dimension, know···

knowledge level ($1.96 \pm 1.02$) points, operational skills ($4.47 \pm 1.16$) points, and complex case handling ($1.62 \pm 0.94$) points. In the opportunity dimension, drug supply assurance scored ($3.38 \pm 1.10$) points, support from diagnostic and treatment facilities ($6.97 \pm 2.40$) points, support from information technology tools ($7.12 \pm 2.18$) points, support in time and workflow ($2.48 \pm 0.76$) points, and training and learning support ($6.41 \pm 2.30$) points. In the motivation dimension, professional identity scored ($4.41 \pm 0.85$) points, concerns about treatment safety ($12.04 \pm 5.00$) points, self-efficacy ($7.79 \pm 3.06$) points, and goal orientation ($4.67 \pm 0.66$) points.

### 2.3 Comparison of lipid management behavior scores among physicians with different basic characteristics

The mean lipid management behavior score of physicians with different basic characteristics was ($15.96 \pm 3.68$) points. Among them, female physicians had higher lipid management behavior scores than male physicians ($P = 0.01$). Comparisons of lipid management behavior scores among groups with different years of medical practice, professional title levels, and numbers of patients seen per week all showed statistically significant differences ($P < 0.05$), as shown in Table 2.

**Table 2** Comparison of lipid management behavior scores among physicians with different basic characteristics ($\bar{x} \pm s$, points) ($n = 387$)

| Group | Cases | Behavior dimension score | $t/F$ value | $P$ value |
|---|---|---|---|---|
| Sex | | | $-2.501^a$ | 0.01 |
| Male | 129 | $15.30 \pm 3.68$ | | |
| Female | 258 | $16.29 \pm 3.64$ | | |
| Age | | | 0.15 | 0.86 |
| $ $40 years | 182 | $15.88 \pm 3.65$ | | |

| Group | Cases | Behavior dimension score | $t/F$ value | $P$ value |
|---|---|---|---|---|
| 41–50 years | 154 | $16.08 \pm 3.72$ | | |
| >50 years | 51 | $15.84 \pm 3.67$ | | |
| Educational level | | | $-0.29^a$ | 0.77 |
| Bachelor's degree or below | 339 | $15.94 \pm 3.65$ | | |
| Above bachelor's degree | 48 | $16.10 \pm 3.88$ | | |
| Years of medical practice | | | 3.12 | 0.03 |
| $ $5 years | 43 | $15.21 \pm 3.32$ | | |
| 6–10 years | 78 | $15.23 \pm 3.94$ | | |
| 11–20 years | 140 | $15.94 \pm 3.78$ | | |
| $ $21 years | 126 | $16.61 \pm 3.44$ | | |
| Type of practice institution | | | $0.51^a$ | 0.61 |
| Urban | 291 | $15.96 \pm 3.74$ | | |
| Rural | 96 | $15.97 \pm 3.49$ | | |
| Professional title | | | 15.59 | <0.01 |
| Resident physician | 69 | $15.67 \pm 3.61$ | | |
| Attending physician | 178 | $15.94 \pm 3.51$ | | |
| Associate chief/chief physician | 110 | $17.16 \pm 3.47$ | | |
| Other | 30 | $12.30 \pm 3.05$ | | |
| Number of patients seen per week | | | 16.88 | <0.01 |
| $ $10 | 96 | $14.27 \pm 3.89$ | | |
| 11–50 | 236 | $16.30 \pm 3.45$ | | |
| >50 | 55 | $17.44 \pm 3.22$ | | |

Note: $^{a}$ indicates $t$ value.

### 2.4 Correlation analysis of lipid management behaviors among primary care general practitioners with capability, opportunity, and motivation dimensions

The results of Pearson correlation analysis showed that lipid management behavior scores among primary care general practitioners were positively correlated with the capability-dimension scores for knowledge level ($r = 0.416$), operational skills ($r = 0.140$), and physician-patient communication ability ($r = 0.257$) ($P < 0.01$); with the opportunity-dimension scores for drug supply assurance ($r = 0.165$), support from diagnostic and treatment facilities ($r = 0.202$), support from information technology tools ($r = 0.379$), support in time and workflow ($r = 0.233$), and training and learning support ($r = 0.220$) ($P < 0.01$). They were negatively correlated with the motivation-dimension score for concerns about treatment safety ($r = -0.458$, $P < 0.01$), positively correlated with self-efficacy ($r = 0.190$, $P < 0.01$), and not correlated with professional identity or goal orientation ($P > 0.05$), as shown in Table 3.

**Table 3** Pearson correlation analysis between lipid management behaviors and each dimension of the COM-B model among primary care general practitioners

| Item | $r$ value | $P$ value |
|---|---|---|
| Capability dimension | | |
| Knowledge level | 0.416 | <0.001 |
| Operational skills | 0.140 | 0.006 |
| Physician-patient communication ability | 0.257 | <0.001 |
| Opportunity dimension | | |
| Drug supply assurance | 0.165 | <0.001 |
| Support from diagnostic and treatment facilities | 0.202 | <0.001 |
| Support from information technology tools | 0.379 | <0.001 |
| Support in time and workflow | 0.233 | <0.001 |
| Training and learning support | 0.220 | 0.001 |
| Motivation dimension | | |
| Professional identity | -0.045 | 0.373 |
| Goal orientation | 0.021 | 0.678 |
| Self-efficacy | 0.190 | <0.001 |
| Concerns about treatment safety | -0.458 | <0.001 |

### 2.5 Multiple linear regression analysis of factors influencing lipid management behaviors among primary care general practitioners

The multicollinearity analysis showed that the VIF values of all independent variables were 1.10–3.18, and the tolerance values were 0.31–0.91; all met the criteria of VIF <10 and tolerance >0.1, indicating that there was no obvious

multicollinearity among the independent variables and that the model-fitting results were stable and reliable.

Using the lipid management behavior score as the dependent variable (assigned as the measured value), and demographic and occupational basic information—including sex, age, highest educational level, type of practice institution, years of medical practice, professional title, and number of patients with dyslipidemia seen per week—as well as the scores of each subdimension of capability, opportunity, and motivation as independent variables (all assigned as measured values), multiple linear regression analysis was performed. The results showed that participants' years of medical practice, number of patients with dyslipidemia seen in outpatient visits per week, knowledge level, complex case handling ability, self-efficacy, and concerns about treatment safety were factors influencing lipid management behaviors ($P < 0.05$). The

Among these, for demographic variables, years in practice ($\beta = 0.141$) and the number of patients with dyslipidemia seen per week ($\beta = 0.148$) were linearly and positively correlated with lipid management behavior ($P < 0.05$); sex, age, highest educational attainment, type of practice institution, and professional title level were not correlated with lipid management behavior ($P > 0.05$). In the capability dimension, knowledge level ($\beta = 0.256$) and ability to handle complex cases ($\beta = 0.129$) were linearly and positively correlated with lipid management behavior ($P < 0.01$). In the opportunity dimension, medication supply assurance, support from diagnostic and treatment facilities, information-technology tool support, time and process support, and training and learning support were all not correlated with lipid management behavior ($P > 0.05$). In the motivation dimension, self-efficacy ($\beta = 0.294$) was linearly and positively correlated with lipid management behavior, whereas concerns about treatment safety ($\beta = -0.417$) were linearly and negatively correlated with lipid management behavior ($P < 0.01$). After model adjustment, $R^2 = 0.518$; the predictors included in the model explained 51.8% of the total variation in lipid management behavior among primary care general practitioners, indicating good model fit. See Table 4.

## 3 Discussion

The behaviour change wheel (BCW), developed by Michie et al. [14] in 2011, is one of the theoretical models commonly used in the field of health behavior, and the COM-B model is the key core within BCW theory for explaining behavior. The COM-B model explains the influencing factors of behavioral change through three aspects—capability, opportunity, and motivation—and can analyze, from both subjective and objective perspectives, the transformation mechanism between individuals' willingness to participate and their participation behavior, thereby providing a comprehensive and systematic understanding of factors that promote or hinder individual behavioral change [14]. Since its proposal, the COM-B model has been widely applied to the exploration of influencing factors for various health behaviors and to the implementation of intervention

measures.

### 3.1 Influence of Demographic Characteristics on Lipid Management Behavior among Primary Care General Practitioners

The results of this study showed that being a female primary care physician, years in practice, professional title level, and the number of patients with dyslipidemia seen per week were all significantly and positively correlated with the standardization of lipid management behavior. Sex differences may stem from differences in physicians' individual diagnostic and treatment cognition and attitudes. The study by Liu Qing et al. [15] also confirmed that female primary care physicians had significantly higher cognitive levels in chronic disease diagnosis and treatment than male physicians. A study from Malaysia also showed that years in practice were positively correlated with the standardization of lipid management practice, suggesting that long-term clinical accumulation can effectively improve the degree of standardization of diagnostic and treatment behaviors [16]. Physicians who saw fewer patients with dyslipidemia each week had relatively lower scores for dyslipidemia management behavior; this may be related to insufficient clinical practice opportunities and difficulty consolidating standardized procedures. Physicians with higher professional titles showed greater standardization in lipid management behavior. This finding is consistent with the policy orientation in the *Implementation Plan of Tianjin Municipality for Further Deepening Reform and Promoting the Healthy Development of the Rural Medical and Health System* [17], namely "improving the quality of primary-level chronic disease management and strengthening professional title incentives for primary-level personnel," and also reflects that physicians with higher professional titles usually possess more systematic professional knowledge and stronger clinical decision-making abilities.

### 3.2 Influence of Factors in the Capability Dimension on Lipid Management Behavior among Primary Care General Practitioners

**Table 4. Multiple linear regression analysis of lipid management behavior dimension scores among primary care general practitioners**

| Variable | B | 95%CI | SE | $\beta$ | t value | P value |
|---|---|---|---|---|---|---|
| Constant | 13.238 | 9.887~16.588 | 1.704 | — | 7.769 | <0.001 |
| Sex | 0.394 | −0.203~0.991 | 0.304 | 0.051 | 1.297 | 0.195 |
| Age | −0.516 | −1.083~0.051 | 0.288 | −0.098 | −1.791 | 0.074 |
| Highest educational attainment | −0.302 | −1.180~0.576 | 0.447 | −0.027 | −0.675 | 0.500 |

| Variable | B | 95%CI | SE | $\beta$ | t value | P value |
|---|---|---|---|---|---|---|
| Years in practice | 0.528 | 0.099~0.956 | 0.218 | 0.141 | 2.420 | 0.016* |
| Type of practice institution | −0.086 | −0.709~0.537 | 0.317 | −0.011 | −0.272 | 0.785 |
| Professional title level | −0.289 | −0.624~0.047 | 0.171 | −0.066 | −1.693 | 0.091 |
| Number of patients with dyslipidemia seen per week | 0.885 | 0.430~1.340 | 0.231 | 0.148 | 3.824 | <0.001 |
| Capability dimension | | | | | | |
| Knowledge level | 3.697 | 2.601~4.793 | 0.557 | 0.256 | 6.632 | <0.001 |
| Operational skills | 0.452 | −0.988~1.892 | 0.732 | 0.024 | 0.617 | 0.537 |
| Ability to handle complex cases | 1.514 | 0.623~2.406 | 0.453 | 0.129 | 3.341 | <0.001 |
| Opportunity dimension | | | | | | |
| Medication supply assurance | 0.724 | −0.563~2.012 | 0.655 | 0.043 | 1.106 | 0.269 |

| Variable | B | 95%CI | SE | $\beta$ | t value | P value |
|---|---|---|---|---|---|---|
| Diagnostic and treatment facility support | −0.352 | −0.754~0.050 | 0.204 | −0.111 | −1.720 | 0.086 |
| Information-technology tool support | 0.034 | −0.365~0.432 | 0.203 | 0.010 | 0.165 | 0.869 |
| Time and process support | −0.004 | −0.349~0.341 | 0.176 | −0.001 | −0.021 | 0.983 |
| Training and learning support | −0.356 | −0.717~0.004 | 0.183 | −0.074 | −1.946 | 0.052 |
| Motivation dimension | | | | | | |
| Professional identity | −0.390 | −0.790~0.010 | 0.204 | −0.090 | −1.917 | 0.056 |
| Goal orientation | 0.181 | −0.346~0.708 | 0.268 | 0.032 | 0.677 | 0.499 |
| Self-efficacy | 1.406 | 1.032~1.779 | 0.190 | 0.294 | 7.399 | <0.001 |
| Concerns about treatment safety | −1.227 | −1.526~−0.929 | 0.152 | −0.417 | −8.092 | <0.001 |

Note: −indicates that no such data are available; linear regression analysis $R^2 = 0.518$, adjusted $R^2 = 0.493$.

**impact**

In this study, the knowledge level of primary care general practitioners was significantly positively correlated with their lipid-management behavior scores. This is consistent with the conclusion of a nationwide survey in Canada [18]. A cross-sectional study of primary care physicians in Europe also showed that physicians' mastery of knowledge directly affects their adherence to clinical practice, and insufficient knowledge reserves are an important cause of non-standardized lipid-management behaviors [19]. Yu Xiaoxiao et al. [7] showed that general practitioners had a relatively low level of mastery of knowledge regarding the rational use of drugs for dyslipidemia, and that training could significantly improve knowledge application and clinical implementation capacity. This suggests that improving primary care general practitioners' knowledge reserves regarding the prevention and treatment of dyslipidemia is key to strengthening their standardized management practices. Therefore, continuing medical education should be provided through lectures, seminars, and other formats to address knowledge gaps in a targeted manner. Previous studies have shown that this strategy can effectively correct physicians' cognitive biases in lipid management, fill knowledge gaps, and significantly improve guideline adherence and the standardization of diagnosis and treatment [20–21]. A qualitative study in Singapore showed that continuing education can increase the rate at which physicians meet competency standards in lipid management by 37.60% [22].

This study found that physician–patient communication ability, as an important component of the "capability" dimension in the COM-B model, has a significant promoting effect on lipid-management behavior. The study by Yang Xu et al. [23] also showed that communication ability is a core competency for standardized lipid management by primary care general practitioners and directly affects guideline implementation and patient target-attainment rates. Studies by Li Dongxu et al. [13] and Lopes et al. [24] reached the same conclusion. A systematic review showed that patient-centered communication and shared decision-making can improve statin adherence by 7%–22% [25]. With socioeconomic development, patients' demands for a better experience and greater convenience in medical services continue to increase. If physicians lack the ability to recognize emotions, perceive needs, and think from patients' perspectives, tensions in the physician–patient relationship can easily arise, affecting the implementation of diagnostic and treatment plans [26]. The "Optimizing Lipid Management Project," launched in Shanghai in 2025, provides a practical reference in this regard. The project promoted a new lipid-stratification laboratory report embedded with a "science-popularization QR code" ; patients could scan the code to obtain plain-language explanations of their own risk stratification, the necessity of long-term statin use, and other commonly needed information. At the same time, special training was used to improve physicians' ability to "express risk stratification in plain language," effectively addressing the problem of asymmetric physician–patient information in which "doctors cannot explain clearly and patients cannot understand" [27]. The *Consensus on Lipid Management in Panvascular Diseases (2025)* [28] also confirmed that

visualized lipid-stratification laboratory reports and plain-language interpretation tools can effectively bridge the information gap between physicians and patients and improve medication adherence and management standardization. Therefore, in the reform of primary medical institutions, it is recommended to draw on the experience of the Shanghai project by equipping institutions with visual communication tools and providing special training in physician–patient communication, thereby improving the effectiveness of lipid management.

### 3.3 Effects of opportunity-dimension factors on lipid-management behaviors among primary care general practitioners

All indicators in the opportunity dimension were significantly positively correlated with lipid-management behavior, but they did not show independent predictive effects in the multiple linear regression. The reasons may mainly involve three aspects. First, interactions among variables may obscure their individual effects [29]; physicians with higher capability can compensate for resource deficiencies by adjusting existing plans. Second, there is a "compensatory effect" within the opportunity dimension: the relative advantages of diagnostic and treatment facilities and information-based tools within the dimension partly offset shortcomings in drug availability and time support. Third, a disconnect between "supply and utilization" also weakens the independent effect of resources on behavior [30]. In addition, the study found that scores for drug-supply assurance, time, and process support in primary lipid management were relatively low. This is consistent with the conclusion of a nationwide cross-sectional study [9], which surveyed 3,041 primary medical institutions and found that only 49.70% were equipped with statin medications. A qualitative study in Singapore pointed out that insufficient consultation time prevents physicians from completing comprehensive risk assessments, explaining the guideline-recommended low-density lipoprotein cholesterol (LDL-C) targets, discussing treatment-intensification plans, and performing other diagnostic and treatment tasks [22]. A study in the United States on primary care physicians' awareness and practice of lipid guidelines showed that 68% of primary care physicians listed time pressure in routine outpatient clinics as a "major barrier" to following lipid guidelines. Responding physicians generally agreed that, if sufficient consultation time were available, the LDL-C target-attainment rate and adherence to guideline-recommended prescribing would be significantly improved [31]. Therefore, it is recommended that health administrative departments promote the downward allocation of core lipid-lowering drugs such as statins to primary care, optimize drug distribution mechanisms through close-knit medical alliances, clarify standards for the provision of lipid-lowering drugs in primary medical institutions, and at the same time implement the requirements of the *Tianjin Municipal Primary Health Care Convenience and Beneficial Services Measures (2023–2025)* [32]. By promoting extended service hours, optimizing outpatient processes, alleviating time pressure, and improving the efficiency of resource utilization, these measures can strengthen primary lipid management.

### 3.4 Effects of motivation-dimension factors on lipid-management behaviors among primary care general practitioners

Concerns about treatment safety in the motivation dimension were significantly negatively correlated with lipid-management behavior scores. This is consistent with the cross-sectional study by Al-ashwal et al. [33] among health-care workers in Yemen. Their survey of 474 physicians and pharmacists showed that 63.5% of respondents were concerned about the risk of drug interactions, and 58.2% were concerned about medication safety in special populations; ultimately, the standardized implementation rate of lipid management was only 41.8%, significantly lower than that among those without obvious concerns. This indicates that excessive consideration of treatment risks can suppress physicians' initiative in diagnosis and treatment, thereby affecting the effective implementation of lipid management. Turhan et al. [34] also reached this conclusion. Although their study population consisted of infectious-disease physicians, primary care general practitioners often face the risk of drug interactions from polypharmacy for chronic diseases in lipid management, and the core motivational mechanisms in the two settings are consistent. The *Chinese Expert Consensus on the Clinical Diagnosis and Management of Statin Intolerance (2024)* [35] pointed out that, in clinical practice, problems exist such as overly broad judgments of the risk of statin adverse reactions and insufficiently standardized management strategies, which can easily lead to inadequate statin dosing and restricted use of intensive lipid-lowering therapy and combination therapy. This suggests the need to help physicians build confidence in evidence-based medication use and alleviate concerns about treatment safety through guideline-interpretation meetings, case-discussion meetings, and similar formats.

In addition, the study also found that the stronger the self-efficacy of primary care general practitioners in lipid management, the more standardized their lipid-management behaviors. Pereira et al. [36], in a study on comorbidity management by family physicians, also showed that the higher the self-efficacy level of medical staff in chronic disease management, the more likely they are to adopt standardized and proactive diagnostic and treatment behaviors. Therefore, in continuing education related to lipid management for primary care general practitioners, segments such as "successful case sharing" and "simulated diagnosis-and-treatment review" may be added so that primary care general practitioners can directly perceive the value of their own abilities. In addition, medical institutions can establish a quality feedback mechanism for lipid management and regularly provide individual physicians with feedback on data such as lipid target-attainment rates and follow-up completion rates among the patients they manage. Objective outcome data can thereby strengthen their sense of self-efficacy and further promote the long-term normalization of standardized management behaviors.

### 3.5 Limitations

This study has the following limitations. First, a cross-sectional survey design was adopted, which can only clarify the associations between lipid-management behaviors among primary care general practitioners in Tianjin and various influencing factors; causal relationships among variables require further verification in subsequent prospective studies. Second, data collection was mainly based on self-administered questionnaires. Although quality was controlled through pilot-survey optimization and dual review, a certain degree of subjective reporting bias may still exist. In future studies, objective approaches such as medical-record verification and on-site observation may be combined to improve data validation. This study focused on analyzing the effects of the core dimensions of the COM-B model and demographic characteristics, and did not comprehensively include external variables such as patients' treatment adherence and performance assessment of medical institutions. Future research may incorporate individual factors such as patients' treatment adherence and health literacy, while further refining psychological and cognitive dimensions such as physicians' risk preferences and trust in guidelines. Through integrated analysis of variables at multiple levels, the influencing mechanisms of lipid-management behaviors among primary care general practitioners can be more comprehensively revealed.

## 4 Conclusions and Recommendations

Based on the COM-B model, this study systematically analyzed lipid-management behaviors and their influencing factors among primary care general practitioners in Tianjin. The results showed that the overall level of lipid-management behavior in this group was moderate, with a score rate of 63.84%. Years of practice, number of patients seen, knowledge level and complex-case management ability in the capability dimension, and self-efficacy and concerns about treatment safety in the motivation dimension had significant effects on lipid-management behavior, whereas the opportunity dimension was not associated with lipid-management behavior.

Based on the study findings, the following recommendations are proposed to improve the standardization of lipid management at the primary care level and support cardiovascular disease prevention and control. First, for physicians with fewer years of practice and lower consultation volumes, targeted knowledge training and hands-on exercises for complex cases should be conducted, with emphasis on strengthening core competencies such as ASCVD risk stratification and the development of individualized medication regimens. Second, a long-term capacity-improvement mechanism should be established. Case-sharing meetings, simulated diagnosis-and-treatment reviews, and other approaches can be used to enhance the self-efficacy of primary care general practitioners and alleviate concerns about treatment safety. In the future, prospective studies may be conducted to verify the effectiveness of various interventions, and multilevel variables such as patient adherence and institutional performance assessment may be incorporated to construct a more comprehensive model of the mechanisms

influencing lipid-management behavior.

Author contributions: Xu Wan and Bian Bo were responsible for proposing the research topic and designing the research protocol; Wang Yan, Li Linglu, and Liu Xin were responsible for literature retrieval, investigator training, and survey implementation; Jia Jie was responsible for data rechecking, proofreading, and revising the initial manuscript; Bian Bo was responsible for quality control of the article and took overall responsibility for the article, including supervision and management.

The authors declare no conflicts of interest.

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