Chinese General Practice Journal 2 (2025) 100088

Contents lists available at ScienceDirect

Chinese General Practice Journal

journal homepage: https://www.keaipublishing.com/en/journals/chinese-general-practice-journal/

Reconfiguring the functional features of primary care in a non-gatekeeping context: A 15-year mixed-methods systematic review from China ☆

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ARTICLE INFO

Keywords:
Functional features
Primary care
General practice
Functional reconfiguration
Health service outcomes
Systematic review
China

ABSTRACT

Background: Basic medical service is the primary manifestation of primary care within China's healthcare system. Since the 2009 healthcare reform, the theory of primary care functional features has been introduced to China. Chinese researchers have since employed international instruments and developed localized tools to evaluate the process quality of these services across diverse regions and populations. This mixed-methods systematic review aims to synthesize qualitative and quantitative evidence regarding the conceptual connotations, intensity levels, and relationships with health service outcomes of different functional features in China's primary care services.

Methods: Following the JBI mixed-methods systematic review framework, we searched six databases (PubMed, Embase, Web of Science, Google Scholar, CNKI, and Wanfang) for qualitative, quantitative, and mixed-methods studies published between January 2009 and March 2025. Two reviewers screened literature using Rayyan and assessed methodological quality using JBI tools. Utilizing a convergent segregated approach, we synthesized the qualitative and quantitative findings separately, and subsequently integrated them to explain the pathways and mechanisms underlying the associations between functional features and health service outcomes.

Results: The review included 60 studies (52 quantitative studies, 4 qualitative studies, and 3 mixed-methods studies). The functional features of China's primary care services can be broadly categorized into six core dimensions: First Contact, Accessibility, Comprehensiveness, Continuity, Coordination, and Patient Empowerment. Their local conceptual connotations have undergone significant reconfiguration compared to the original theoretical constructs. Overall, the intensity level of these features is medium-to-high. Stronger measurement levels are positively associated with multiple critical health service outcomes, including improved patient health status, enhanced patient experience, lower healthcare costs, preference for primary care first-contact, and reduced general hospital utilization. Furthermore, clear mechanistic pathways influencing key outcomes were identified for the first five features.

Conclusion: This review validates the real-world value of sustained investment by the Chinese government and society in primary healthcare reform. It supports the strategic enhancement of these functional features to maximize their capacity to improve health outcomes. Finally, it highlights the imperative for future research to employ broader, deeper, and more precise methodologies to capture the evolving nature of primary care in China.

Introduction

China's Law on Basic Healthcare and Health Promotion (2019) defines "basic medical service"—functioning as the fundamental form of primary care within the Chinese system—as the essential clinical component of healthcare, encompassing prevention, diagnosis, treatment, nursing, and rehabilitation. Mandated as an equitable and affordable right adaptable to socioeconomic development,[1] these services are primarily delivered to community residents by general practitioners (GPs) and family doctors in primary healthcare institutions. However, compared to specialized care in general hospitals, the distinct process characteristics of this localized form of primary care remain underexplored. Understanding the unique value of these services, their impact on patients and society, and their real-world implementation mechanisms is

☆ Peer review under the responsibility of Editorial Office of Chinese General Practice Journal.

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https://doi.org/10.1016/j.cgpj.2025.100088
Received 10 November 2025; Received in revised form 24 November 2025; Accepted 9 December 2025

fundamental to establishing the theoretical basis for general practice in China.

To date, the most widely accepted theoretical framework for characterizing these services is the "functional features" theory proposed by Starfield et al.[2] This theory posits that primary care possesses unique attributes—distinct from specialty care—whose intensity is closely linked to superior health service outcomes.[2] The framework is anchored by four core features, known as the "4Cs": First Contact (comprising gatekeeping and accessibility), Comprehensiveness (in terms of service scope and ability), Continuity (both personal and longitudinal), and Coordination.[2,3] Beyond these core domains, other functional features such as "person-centered care," "patient empowerment," "family orientation," and "community orientation" have also been identified as critical indicators of process quality.[4-6]

Internationally, these functional features are typically assessed using validated instruments such as the Primary Care Assessment Tool (PCAT),[7] Person-Centered Primary Care Measure (PCPCM),[8] and General Practice Assessment Questionnaire (GPAQ).[9] These tools generally employ Patient-Reported Experience Measures (PREMs)[10] to quantify the intensity of features as perceived by patients. Since China's 2009 healthcare reform, researchers have translated and adapted these international instruments to evaluate local service quality.[11-13] Furthermore, indigenous instruments tailored to the Chinese context, such as the Assessment Survey of Primary Care (ASPC) developed by Kuang et al.,[14] have been constructed. Complementing these quantitative metrics, qualitative studies utilizing semi-structured interviews and focus groups have also been conducted across various regions,[15-17] aiming to deeply explore how these functional features manifest in China's specific social context and how they are experienced by residents.

Theoretically, upstream structural quality determinants shape downstream process quality performance.[20] Given that the social background, healthcare infrastructure, and service scope in China differ significantly from Western models,[18,21] the manifestation of these functional features likely differs as well. Although isolated studies have explored the associations between these features and health outcomes,[15,22–26] there is no systematic synthesis of evidence regarding their conceptualization, intensity, and impact pathways since the deepening of the healthcare reform in 2009. Consequently, this mixed-methods systematic review synthesizes quantitative and qualitative evidence generated over the past 15 years. It examines primary care services delivered by community-based general practitioners and family doctor teams (roles that significantly overlap in practice) to determine their functional connotations, intensity levels, and mechanisms of impact on health outcomes. This review aims to provide rigorous evidence to inform policy, advance theory, and improve quality for primary care in China and comparable low- and middle-income settings.

Method

This review followed the Joanna Briggs Institute (JBI) methodology for mixed-methods systematic reviews[27] and was registered with PROSPERO (CRD420251028411). The review process encompassed literature search, study selection, critical appraisal, data extraction, and evidence synthesis. Compared to the protocol published on medRxiv,[28] the final implementation incorporated an additional step: inferring the intensity levels of functional features during qualitative data synthesis to facilitate cross-validation with quantitative results. All other procedures remained consistent with the original protocol.

Search strategy

The full search strategy is detailed in the appendix of the published protocol.[28] We searched six databases—PubMed, Embase, Web of Science, Google Scholar, CNKI, and Wanfang Data—for studies published between January 1, 2009, and March 31, 2025. The search was limited to articles in Chinese and English. Additionally, we manually screened the reference lists of all included studies to identify further relevant literature.

Study selection

Duplicate removal and screening were performed by two reviewers (YW and HJ) using Rayyan (Rayyan Systems Inc., Doha, Qatar). Both reviewers possess extensive experience in this field and have published relevant studies.[15,21,26] The eligibility criteria were as follows:

Inclusion criteria

(1) Participants: Frontline providers (e.g., GPs, family doctor teams), patients, or residents utilizing primary care services in China.
(2) Timeframe: Studies published between January 1, 2009, and March 31, 2025.
(3) Setting: Studies conducted in mainland China.
(4) Study Type: Original research (e.g., journal articles, conference papers) or grey literature (e.g., dissertations).
(5) Design: Quantitative (e.g., cohort, cross-sectional), qualitative (e.g., interviews, focus groups), or mixed-methods studies with distinct quantitative/qualitative components.
(6) Qualitative outcomes: Studies reporting experiential data on the forms, conceptual connotations, or intensity of functional features, or perceptions regarding their pathways affecting health service outcomes.
(7) Quantitative outcomes: Studies clearly reporting intensity levels of functional features (overall or specific dimensions like accessibility) and potentially examining their associations with health service outcomes (e.g., health status, costs, satisfaction).

Exclusion criteria

(1) Studies conducted in regions with distinct primary care systems, such as Hong Kong, Macao, and Taiwan.
(2) Studies lacking sufficient methodological or data details to permit quality assessment (e.g., conference abstracts).
(3) Duplicate publications from the same study; only the article with the largest sample size and most comprehensive reporting on functional features was retained.

Initial screening based on titles and abstracts was conducted by one reviewer (YW). Subsequently, doubtful records were re-screened in full text by both reviewers (YW and HJ). Disagreements were resolved through consultation with a third reviewer (DY). The detailed screening process is presented in the PRISMA flow diagram (Fig. 1).

Methodological quality assessment

We assessed methodological quality using JBI critical appraisal tools. Qualitative studies were evaluated using the JBI Checklist for Qualitative Research,[29] and cross-sectional surveys using the JBI Checklist for Analytical Cross Sectional Studies.[30] Items were scored as "met" (1), "not met" (0), or "unclear" (0.5).

For cross-sectional studies, we modified the assessment criteria. Since many studies utilized functional feature intensity as an outcome rather than an exposure variable, the reliability of exposure measurement (Items 3–6) was deemed irrelevant to the validity of the outcome measurement. Consequently, these items were excluded for such studies. An average score (0–1) was calculated for each study. To ensure evidence reliability, only studies with a score >0.8 (i.e., meeting >80 % of quality criteria) were included for synthesis; lower-scoring studies served only as supplementary background. Quality appraisal was conducted by two reviewers (YW and HJ), with disagreements resolved by a third (DY).

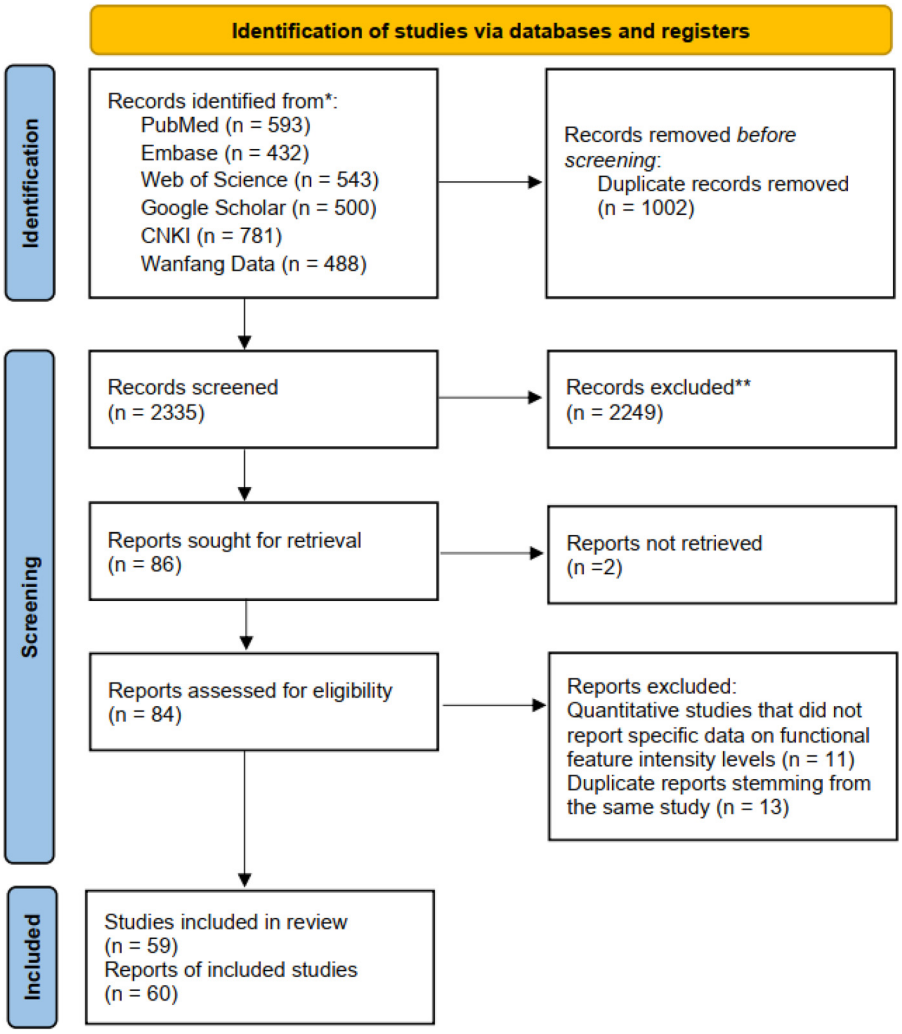

Fig. 1. PRISMA flow diagram.

Data extraction

Two reviewers (YW and HJ) independently extracted qualitative and quantitative data using a pre-designed Excel form and cross-checked results. The extraction fields aligned with the protocol.[28]

- Qualitative data included: author, year, region, setting, participants, data collection/analysis methods, themes, and relevant citations.
- Quantitative data included: author, year, region, setting, participants, design, sample size, exposure/outcome variables and their measurement tools/values, statistical methods, and associations/differences.

Disagreements were resolved through consultation with a third reviewer (DY).

Data synthesis and presentation

We employed a convergent segregated approach,[27] synthesizing qualitative and quantitative evidence separately before final integration.

Qualitative Synthesis: Using the JBI meta-aggregation approach[29] and the functional features framework,[2] we synthesized evidence on: (1) stakeholders' experiences of functional features; (2) judgments of intensity levels; and (3) perceived pathways impacting health service outcomes. Data were coded using MAXQDA 2020. To facilitate integration, we mapped qualitative descriptions of feature intensity onto a five-level scale (e.g., Weak [0–20] to Strong [81–100]).

Quantitative Synthesis: This phase focused on: (1) constructs of measurement tools; (2) intensity levels of functional features; and (3) associations with health service outcomes. A meta-analysis (using Stata 17.0SE) was conducted only when ≥5 studies[31] used highly consistent tools (e.g., PCAT "First Contact"). Heterogeneity was assessed via Chi-square, I^2, and Tau^2 statistics, with funnel plots for publication bias. For data unsuitable for meta-analysis, we converted scores to a standardized 0–100 scale and performed a narrative synthesis. Based on the distribution of these standardized scores, we assigned an overall intensity level (Weak [0–20] to Strong [81–100]) to each feature. Associations with health outcomes were synthesized narratively due to the scarcity of studies with identical variable definitions.

Final Integration: We used a juxtaposition table to integrate findings. First, we compared qualitative and quantitative results regarding "conceptual connotations" and "intensity levels" to identify consistencies, discrepancies, or complementarities. Second, we integrated findings on the "relationships and pathways between functional features and health outcomes," assessing whether qualitative insights supported or explained the quantitative associations.

Results

Study selection and characteristics

The initial search yielded 3337 records. After removing duplicates, 2335 records were screened by title and abstract, resulting in the exclu-

sion of 2249. Full-text assessment of the remaining 84 articles led to the exclusion of 24. Ultimately, 60 studies were included: 52 quantitative, 4 qualitative (one study published across two papers), and 3 mixed-methods studies (Fig. 1). All included studies met the methodological quality criteria (Tables S1, S2).

Table S3 details the characteristics of the seven included qualitative studies (including the qualitative components of three mixed-methods studies).[15–17,32–36] These studies involved 425 stakeholders (148 residents, 241 patients, and 15 medical staff). Five studies were published after 2020, and five were conducted in the Yangtze River Delta region (Shanghai, Jiangsu, Zhejiang). Only two studies involved participants from northern or central-western China. Six studies were situated in urban community health centers (CHCs), with only one in a rural primary care setting. All utilized thematic analysis.

Table S4 presents the characteristics of the 53 cross-sectional studies (including the quantitative components of one mixed-methods study).[11–13,15,22,25,37–82] These surveys covered 97,638 patients/residents and 3179 primary care staff. Regarding publication timing, 4 studies (8 %) appeared before 2015, 16 (30 %) between 2015–2019, and 33 (62 %) in 2020 or later. Geographically, studies were concentrated in the Yangtze River Delta (n = 12, 23 %), Pearl River Delta (Guangdong) (n = 11, 21 %), Beijing (n = 6, 12 %), and Sichuan (n = 4, 8 %). Twenty-six studies (49 %) were urban-based, 17 (32 %) mixed urban-rural, and 10 (19 %) rural-only.

Synthesis of qualitative findings

The meta-aggregation of qualitative data[15-17,32–36] is presented in Table S5. Data were categorized into six themes:

- First Contact[15]: Practically defined as “guiding patients to appropriate medical care”;
- Accessibility[15-17,32–36]: Characterized as “convenience of access,” encompassing remote services, proximity, ease of appointment, non-standard hours, and cost advantages over hospitals;
- Comprehensiveness[15-17,32–36]: Defined as “meeting medical needs,” covering the management of simple and complex diseases, medication access, and diagnostic quality;
- Continuity[15-17,32,34–36]: Referred to “long-term provider-patient collaboration,” involving familiarity/trust and longitudinal health management;
- Coordination[15-17,32,34,36]: Focused on “cross-institutional collaboration,” specifically upward referrals to general hospitals and EMR interoperability;
- Patient Empowerment[15-17,32,34,36]: Described as “interaction enhancing self-management,” involving respectful communication and empowerment through treatment.

Regarding intensity, “Accessibility” and “Patient Empowerment” were rated medium-to-high; “Continuity” was medium; “Comprehensiveness” was low-to-medium; while “First Contact” and “Coordination” remained indeterminate.

Regarding health outcomes, qualitative evidence suggested associations between feature intensity and specific outcomes: “First Contact” with health status[15]; “Accessibility” with first-contact preference and mental health[15-17,32–36]; “Comprehensiveness” with first-contact preference, health status (short/long-term), and costs[15-17,32–36]; “Continuity” with first-contact preference, health status, and elderly mental health[15-17,32,34–36]; and “Patient Empowerment” with first-contact preference, health status, mental health, and satisfaction.[15-17] No qualitative data supported the “Coordination” dimension.

Synthesis of quantitative findings

The synthesis of quantitative data[11-13,15,22,25,37–81] is summarized in Table S6. In addition to the six core dimensions—First Contact,[11-12,22,37,39–41,43–46,48,50,55,57–58,60,64,70,73,75,82] Accessibility (encompassing overall accessibility,[11-13,15,22,25,37,39–41,43–46,48,50,52–53,55,57–58,60,62,64,67,70,72–73,75,78–80,82] proximity,[38,51,61] waiting time,[38,49,51] and out-of-pocket expenses[38,51,52,62,80]), Comprehensiveness (involving service scope,[11,13,15,22,37,39–41,43–46,48,50,52,55,57,58,60,62,64,70,72,73,76–78,82] medical ability,[38,51–52,59,62,65–66,72,73,76,81] medication supply,[38,52] and diagnostics[38]), Continuity (involving overall continuity,[11,12,22,37,39–41,43–46,48,50,55,57,58,60,64,70,73,75,82] doctor-patient familiarity and trust,[13,15,42,47,52,56,61,63,74,77] and longitudinal health management[11-13,15,22,25,37–41,43–48,50–52,55–59,60–66,68–70,72–77,82]), Coordination (involving referrals[11,13,15,22,37,39–41,43–46,48,50,53,55,57,58,60,64,70,72,73,75,77,78,82] and electronic medical record integration[11,37,39–41,43–46,48,50,55,57,58,60,64,70,73,75]), and Patient Empowerment (involving friendly attitude[38,49,52] and communicative empowerment[12,22,38,49,51,53,62,63,71,72])—nine additional functional features were identified. These included Family Orientation,[11,13,15,37,39–41,43–46,48,50,55,57–58,60,64,70,72–73,75,77] Community Orientation,[11,13,15,37,39–41,43–46,48,50,55,57,58,60,64,70,73,75,77] Cultural Competence,[11,37,39–41,43–46,48,50,55,57–58,60,64,70,73,75] Integration,[13,15,77] Professional Ethics,[13,15,49,52,77] Equity,[78,79] Efficiency,[78] Service Improvement,[79] and Teamwork.[67]

Table S7 details the development background, construct characteristics, and psychometric properties of the 33 measurement tools utilized in these studies. Based on the quantitative data, the intensity levels of most functional features were judged as medium-to-high. However, four dimensions—Comprehensiveness (medical ability), Continuity (doctor-patient familiarity/trust, longitudinal health management), Family Orientation, and Community Orientation—potentially exhibited low or low-to-medium intensity. Additionally, a meta-analysis of 17 studies using the PCAT (Figure S1) revealed significant heterogeneity and indicated a non-negligible risk of publication bias.

Regarding relationships with health service outcomes, six studies demonstrated that stronger overall functional features within China’s primary care system were significantly and positively associated with five key outcomes: improved patient health status[15,26]; patient satisfaction[45]; patient compliance[23]; glycemic control in diabetic patients[24]; and reduced general hospital utilization.[22] Another study identified functional features as a significant mediator between “family doctor contracting” and “reduced avoidable hospitalizations”[73] (Table 1).

Specifically, First Contact was positively associated with better glycemic control,[24] patient compliance,[23] and lower overall hospital utilization.[22] Accessibility correlated with better health outcomes,[25] glycemic control,[24] patient satisfaction,[45] compliance,[23] lower general hospital emergency utilization,[22] and higher rates of family doctor contracting[52] and renewal willingness.[61] Comprehensiveness was linked to better glycemic control,[24] patient satisfaction,[45] lower general hospital outpatient and overall utilization,[22] and higher contracting[52] and renewal willingness.[61] Continuity correlated with better glycemic control,[24] satisfaction,[45] compliance,[23] lower medical costs,[68] and higher contracting[52] and renewal willingness,[61] but also with higher general hospital emergency utilization.[22] Coordination was associated with better glycemic control,[24] satisfaction,[45] compliance,[24] and lower general hospital utilization, outpatient visits, and admission rates.[22] Patient Empowerment correlated with better glycemic control,[24] compliance,[23] lower general hospital outpatient and overall medical visits,[22] and higher family doctor contracting behavior[52] (Table S6).

Final synthesis results

Table 2 presents the integrated findings on concepts and intensity. Regarding conceptual consistency, “Accessibility,” “Comprehensiveness,” and “Continuity” showed relative alignment between qualitative themes and quantitative constructs, despite some nuances. Conversely, distinct divergences emerged for “First Contact,” “Coordination,” and “Patient Empowerment.” For First Contact, qualitative data

Table 1
Relationships between functional features of primary care services and health service outcomes.

Health Service Outcomes	Statistical Results
Patient Health Status	Association of PCPCM score with EQ VAS score: OR = 1.18, 95 % CI: 1.03–1.35, P = 0.019 Association of PCAT score with self-reported dichotomous health status: OR = 1.02, 95 % CI: 1.01–1.03, P = 0.002
Patient Satisfaction	Association of PCAT score with self-reported dichotomous patient satisfaction: OR = 1.12, 95 % CI: 1.10–1.14, P < 0.01
Patient Adherence	Association of ASPC score with out-of-hospital treatment adherence questionnaire scores in diabetic patients: OR = 1.27, 95 % CI: 1.14–1.43, P < 0.001
Glycemic Control in Diabetic Patients	Association of PCAT score with rate of poor glycemic control: OR = 0.12, 95 % CI: 0.06–0.23, P < 0.001
General Hospital Utilization Rate	Association of ASPC score with general hospital utilization rate: OR = 0.42, 95 % CI: 0.31–0.57, P < 0.001
Family Doctor Contracting and Reduction in Avoidable Hospitalizations	Functional characteristics mediate the relationship between family doctor contracting and reduction in avoidable hospitalizations. Total effect: -0.22; Mediating effect: -0.05 (accounting for 22.73 % of the total effect).

Table 2
Juxtaposition Table: Concepts and intensity levels of functional features.

Functional Features	Connotations of Qualitative Themes	Constructs of Quantitative Measures	Consistency between Qualitative Themes and Quantitative Dimensions	Intensity Level (Qualitative)	Intensity Level (Quantitative)	Consistency of Qualitative and Quantitative Synthesis Results
First Contact	PHC doctors provide professional judgment and advice for timely medical attention and selection of departments/institutions based on patients' health status.	(1) Utilization of Community Health Centers as the first point of contact; (2) First-contact care behavior where patients seek General Practitioners (GPs) first; (3) Feedback on receptionists' service attitude and helpfulness.	Inconsistent. Qualitative results emphasize "guidance/navigation" from doctors, while quantitative results primarily measure "PHC utilization" and "receptionist information guidance."	Uncertain	Medium-High	Inconsistent but not contradictory; comparison is difficult due to insufficient qualitative data.
Accessibility	PHC staff provide rapid, convenient, and accessible services through structural conditions such as close proximity, easy appointments, short queues, remote services, extended hours, and lower out-of-pocket costs compared to general hospitals.	(1) Convenience of obtaining medical services; (2) Time required to obtain care when needed; (3) Distance and accessibility of the facility; (4) Convenience of appointments and waiting time; (5) Affordability of service costs.	Basically consistent, though the quantitative synthesis results lack the aspect of "provision of remote services."	Medium-High	Medium-High	Consistent
Comprehensiveness	PHC institutions and doctors provide accurate and effective diagnosis/treatment for simple diseases (common/mild) and complex diseases (specialized/severe/surgical); prescribe necessary medications; and conduct reliable, reasonable tests/examinations.	(1) Scope of basic medical services and supply capacity; (2) Clinical diagnosis and health management capabilities of medical staff, especially GPs; (3) Quality of the diagnostic process (e.g., guideline adherence, accuracy, outcomes); (4) Scope and accessibility of clinical drug supply; (5) Scope of clinical laboratory services.	Basically Consistent. Qualitative results clearly distinguish between "simple" and "complex" diseases, while quantitative dimensions merge them.	Low-Medium	Medium Low-High	Inconsistent: The overall intensity level suggested by qualitative results is one tier lower than quantitative results, possibly influenced by the surveyed population's selection bias.
Continuity	Based on long-term doctor-patient interaction and continuous health management—where doctors know patients' history and patients trust doctors—doctors provide continuous, personalized services, disease tracking/management, and medication/lifestyle guidance.	(1) Continuity of care achieved through long-term therapeutic relationships; (2) Long-term interpersonal relationship and familiarity with GPs (understanding, trust, loyalty, respect); (3) GPs' continuous knowledge of patient history, living environment, daily activities, health status, and treatment plans; (4) Management continuity via telephone follow-ups, home visits, and health education; (5) Shared experience of the natural history of many health problems.	Basically Consistent. Qualitative results omit the aspect of "doctors and patients jointly experiencing the natural history of health problems."	Medium	Medium	Basically Consistent

(*continued on next page*)

Table 2 (*continued*)

Functional Features	Connotations of Qualitative Themes	Constructs of Quantitative Measures	Consistency between Qualitative Themes and Quantitative Dimensions	Intensity Level (Qualitative)	Intensity Level (Quantitative)	Consistency of Qualitative and Quantitative Synthesis Results
Coordination	When facing complex or unsolvable health problems, PHC doctors make accurate judgments, assist/guide patients in referring to higher-level institutions, and access full electronic medical records via public EHR systems.	(1) Articulation and coordination of services between different system levels; (2) Smoothness of referral services provided by PHC doctors (timeliness, patient participation in choice, detail of information, meeting needs, and follow-up after return to community); (3) Coordinated management of patient health records.	Partially Consistent. Quantitative constructs (1) and (3) focus on the health system perspective. Qualitative results focus narrowly on "assistance with upward referral" (dimension 2), omitting continuous tracking and downward referral.	Uncertain	Medium-High	Inconsistent but not contradictory; comparison is difficult due to insufficient qualitative data.
Patient Enablement	PHC staff establish good interactions through friendly, respectful attitudes and patient, clear communication. They fully understand the patient's condition, provide comprehensive information, thereby enhancing the patient's understanding of their health/medical issues and their ability to cope.	(1) Friendliness of staff and feeling of being treated with respect; (2) Doctors' communication skills and clarity in explaining disease/treatment (listening, clarifying, unbiased info, time for questions); (3) Experience of participating in treatment decisions (shared power, planning, respecting preferences); (4) Patient-centered care (bio-psycho-social perspective, holistic health, counseling, education, self-management enablement); (5) Degree of doctor's care and responsiveness to expectations/needs/emotions (listening to experiences, responding to needs, emotional support).	Partially Consistent. Quantitative dimensions (3), (4), and (5) involve concepts like shared decision-making and holistic thinking, which are advanced techniques for achieving empowerment, whereas qualitative data focuses on basic communication and attitude.	Medium High-High	Medium-High	Basically consistent

Note: PHC: Primary Healthcare; EHR: Electronic Health Record.

revealed no clear stakeholder demand for "gatekeeping." For Coordination, qualitative data focused narrowly on "upward referral," neglecting "downward referral" and "comprehensive management." For Patient Empowerment, qualitative data emphasized tangible aspects like "attitude" and "communication," overlooking technical models like "shared decision-making" or "opportunistic preventive advice."

Regarding intensity, judgments aligned for "Accessibility" and "Patient Empowerment" (medium-to-high) and "Continuity" (medium). However, "Comprehensiveness" was rated lower qualitatively (low-to-medium) than quantitatively (medium-low to high). Comparisons for "First Contact" and "Coordination" were precluded by insufficient qualitative data.

Table 3 integrates findings on health service outcomes. Overall, qualitative insights well supported and explained the quantitative associations for: "Accessibility" with first-contact preference and satisfaction; "Comprehensiveness" and "Continuity" with first-contact preference and long-term health; and "Patient Empowerment" with first-contact preference. However, gaps in cross-validation remained for several dimensions, most notably "Coordination," which lacked qualitative data entirely. Furthermore, while the direction of association for "First Contact" was consistent, conceptual discrepancies limited the explanatory power of the qualitative evidence.

Discussion

This review yields three primary findings. First, six functional features characterize China's primary care services. While conceptually aligning with the "First Contact," "Accessibility," "Comprehensiveness," "Continuity," "Coordination," and "Patient Empowerment" constructs found in international tools, their practical connotations exhibit distinct contextual adaptations. Second, intensity levels vary significantly: "Accessibility" and "Patient Empowerment" are relatively strong, whereas "Comprehensiveness" scores lower. Notably, quantitative studies demonstrate substantial heterogeneity and publication bias. Third, despite these variations, enhanced functional features are positively associated with improved health status, patient experience, cost containment, and first-contact preference. We identified at least five distinct pathways through which these features influence outcomes, providing a framework for future research.

The divergence between local realities and international theoretical constructs requires a nuanced interpretation. Five of the identified features align with Starfield's "4Cs," and "Patient Empowerment"—though distinct—echoes the GPAQ[12] and the Patient Enablement Instrument (PEI).[83] This suggests that China's primary care model remains rooted in classic frameworks. However, structural factors unique to China—specifically the absence of a gatekeeping system, weak person-centered management, and a treatment-focused rather than prevention-focused medical culture—have driven a functional reconfiguration of these features. This adaptation is most pronounced in "First Contact," "Coordination," and "Patient Empowerment," representing a pragmatic response to the local healthcare environment.

Consequently, while quantitative scores suggest "good" process quality (comparable to international benchmarks reported by D'Avila et al.[84] and Zyzanski et al.[85]), two critical issues undermine the robustness of

Table 3
Juxtaposition Table: Impact of functional features on health service outcomes.

Functional Features	Quantitative: Associated Health Service Outcomes & Strength of Relationship	Qualitative: Associated Health Service Outcomes & Impact Pathways	Consistency between Qualitative and Quantitative Synthesis Results	Can Qualitative Results Explain Quantitative Results?
First Contact	1. General Hospital Utilization Rate: OR=0.811, 95% CI=0.666–0.989, p<0.05 **2. Rate of Poor Glycemic Control: OR=0.36, 95% CI: 0.22–0.58, p<0.001** 3. Patient Satisfaction: OR=1.00, 95% CI: 1.00–1.01 4. Patient Adherence (Diabetes): OR=1.12, 95% CI: 1.04–1.20, p=0.008	**Health: This feature affects whether patients can seek medical attention in a timely and accurate manner, thereby influencing their health status.**	The overlapping areas (health improvement) are generally consistent in direction, both indicating that first contact may contribute to better health outcomes. However, due to distinct differences in dimension definitions between the two data types in Table 3, the ability to cross-validate quantitative and qualitative results is limited where exposures (causes) may differ.	Partially explainable. Quantitative results show that better primary care first contact is associated with better glycemic control. This can be explained by the qualitative finding that "advice from PHC doctors prompts patients to seek timely and accurate medical care." However, qualitative results lack direct explanatory power for the other three outcomes.
Accessibility	**1. General Hospital Emergency Visits: AOR=0.333, 95% CI=0.169–0.656, p<0.01** **2. Willingness to Renew Family Doctor (FD) Contract: Walking time <15 min vs. ≥30 min: OR=1.209, 95% CI=1.003–1.458, p=0.046;Walking time 15–29 min vs. ≥30 min: OR=1.288, 95% CI=1.124–1.475, p<0.001** **3. FD Contracting: Satisfaction with medical costs: Satisfied vs. Dissatisfied: OR=0.81, 95% CI=0.41–1.62, p=0.55;Neutral vs. Dissatisfied: OR=0.73, 95% CI=0.36–1.49, p=0.39** 4. Rate of Poor Glycemic Control: OR=0.23, 95% CI: 0.14–0.38, p<0.001 **5. Patient Satisfaction: OR=1.03, 95% CI: 1.02–1.05, p<0.01** 6. Health Status: EQ VAS Score: Compared to "Completely inaccessible", significantly higher scores were seen in "Somewhat accessible" (β=2.96), "Mostly accessible" (β=5.71), and "Completely accessible" (β=8.10). EQ-5D Utility Coefficient: Similar positive trends observed compared to reference group.7. Patient Adherence (Diabetes): OR=1.21, 95% CI: 1.10–1.32, p=0.001	**1. First Contact: Residents may prioritize PHC over large general hospitals due to advantages in remote consultation, proximity, appointment scheduling, convenient hours, and lower out-of-pocket expenses (lower time/effort/financial costs), provided their medical needs are met.** **2. Mental Health: Psychological anxiety and discomfort caused by queuing for care may be reduced by easier appointments and shorter waiting times.**	The overlapping areas (First Contact, Patient Satisfaction) are consistent in direction. The three quantitative outcomes ("General hospital use," "FD contracting," "FD renewal") essentially relate to the preference between PHC (First Contact) and general hospitals. The quantitative outcome of "Patient Satisfaction" relates to the qualitative outcome of "Mental Health," with consistent directions.	The overlapping areas (First Contact, Patient Satisfaction) can be explained. Quantitative results show better accessibility correlates with higher FD contracting/renewal rates and lower emergency utilization. Qualitative results explain this as better accessibility reducing time, energy, and financial costs, making patients more inclined to seek primary (GP) care first. Additionally, the improvement in patient satisfaction shown in quantitative results may be the result of improved mental health (mood) due to good accessibility as indicated in qualitative findings.
Comprehensiveness	**1. General Hospital Utilization Rate: AOR=0.695, 95% CI=0.572–0.843, p<0.001** **2. General Hospital Outpatient Visits: AOR=0.715, 95% CI=0.571–0.894, p<0.01** **3. FD Contracting: Service Scope: Satisfied vs. Dissatisfied: OR=1.72 (p=0.01); Service Effectiveness: Neutral vs. Dissatisfied: OR=1.52 (p=0.31); Drug Supply: Satisfied vs. Dissatisfied: OR=1.44 (p<0.01)** **4. Rate of Poor Glycemic Control: Service Availability: OR=0.29 (p<0.001)** **Service Supply: OR=0.27 (p<0.001)** 5. Patient Satisfaction: OR=1.06, 95% CI: 1.04–1.07, p<0.05	**1. First Contact: Affects whether PHC scope/capacity meets actual needs, influencing trust/confidence and the decision to bypass PHC for general hospitals.** 2. Health (Short-term): Rapid/accurate diagnosis and treatment for simple diseases facilitate quick recovery, reducing negative impact on life/work. **3. Health (Long-term): Accurate/economical drugs and lifestyle advice for chronic diseases maintain long-term health and prevent deterioration.** 4. Expenses: Excessive unnecessary tests may increase costs. 5. Coordination: For complex diseases, determines if patients can be referred back to PHC. 6. Accessibility: Drug shortages requiring repeat visits weaken accessibility.	The overlapping areas (First Contact, Long-term Health Status) are consistent in direction. However, the other four qualitative outcomes are not supported by quantitative results. Conversely, the quantitative outcome of "Patient Satisfaction" is not supported by qualitative results.	The overlapping areas (First Contact, Long-term Health Status) can be explained. Quantitative results relate better comprehensiveness to higher FD contracting and lower hospital utilization. Qualitative results explain this: PHC better meets diverse needs, enhancing patient confidence and preference for PHC first contact, and health improvements reduce the need for hospital visits. Better glycemic control (Quantitative) is explained by accurate medication and personalized lifestyle advice (Qualitative).

(*continued on next page*)

Table 3 (*continued*)

Functional Features	Quantitative: Associated Health Service Outcomes & Strength of Relationship	Qualitative: Associated Health Service Outcomes & Impact Pathways	Consistency between Qualitative and Quantitative Synthesis Results	Can Qualitative Results Explain Quantitative Results?
Continuity	1. General Hospital Emergency Visits: AOR=2.252, 95% CI=1.051–4.825, p<0.05 **2. FD Contracting (Doctor-Patient Relationship/Trust): Satisfied vs. Dissatisfied: OR=1.22 (p=0.66)** **3. FD Contract Renewal Willingness: Trust vs. Mistrust: OR=4.403 (p<0.001)** 4. Medical Expenses: For every 0.1 unit increase in continuity indices, total costs decrease by 5.87–8.88%, reimbursed costs by 3.13–5.95%, and out-of-pocket costs by 8.88–12.54%. **5. Rate of Poor Glycemic Control: OR=0.22 (p<0.001)** 6. Patient Satisfaction: OR=1.03 (p<0.01) 7. Patient Adherence: OR=1.15 (p=0.005)	**1. First Contact: Familiarity and personalized services make residents prioritize PHC.** 2. Health (Short/**Long-term**): Familiarity improves diagnostic accuracy/effectiveness; **longitudinal management creates cumulative empowerment effects, improving health.** 3. Mental Health (Elderly): Health education activities provide a sense of social care and warmth.	Directions are consistent regarding FD contracting/renewal (First Contact) and long-term health improvement. However, regarding General Hospital Emergency Visits, qualitative and quantitative results are contradictory. Additionally, quantitative support is lacking for the relationship between continuity and mental health; qualitative support is lacking for continuity's relationship with medical expenses and patient satisfaction.	The overlapping areas (First Contact and Long-term Health) can be explained. Higher contracting/renewal rates (Quantitative) are explained by patient preference for familiar doctors/personalized care (Qualitative). Better glycemic control is explained by the cumulative effect of longitudinal management. Lower medical expenses (Quantitative) can be partially explained by more accurate diagnosis and cumulative patient empowerment (Qualitative). However, the association between better continuity and higher emergency visits (Quantitative) contradicts the qualitative direction and remains unexplained, despite the theoretical possibility that emergencies require higher capability regardless of continuity.
Coordination	1. General Hospital Utilization Rate: AOR=0.143 (p<0.001) 2. General Hospital Outpatient Visits: AOR=0.125 (p<0.001) 3. General Hospital Inpatient Rates: AOR=0.234 (p<0.001) 4. Rate of Poor Glycemic Control: OR=0.26 (p<0.001) 5. Patient Satisfaction: OR=1.02 (p<0.01) 6. Patient Adherence: OR=1.16 (p=0.003)	No relevant information presented	Cannot compare due to lack of qualitative results.	Cannot explain due to lack of qualitative results.
Patient Enablement	**1. FD Contracting (Satisfaction with Doctor's Attitude/Behavior): Satisfied vs. Dissatisfied: OR=1.50 (p=0.31)** **2. General Hospital Utilization Rate: AOR=0.729 (p<0.01)** **3. General Hospital Outpatient Visits: AOR=0.702 (p<0.01)** 4. Patient Adherence (Diabetes): OR=1.13 (p=0.014)	**1. First Contact: Sufficient communication improves medical experience and perceived "quality of care," making patients prioritize PHC.** 2. Health (Short-term): Detailed communication improves diagnostic accuracy and health outcomes. 3. Mental Health: Friendly attitudes and patience alleviate anxiety/fear. 4. Patient Satisfaction: Respectful, clear communication improves experience, mood, and satisfaction.	In overlapping areas (First Contact), qualitative and quantitative data are consistent. However, the relationship between patient enablement and patient adherence (Quantitative) is not supported by qualitative results.	The overlapping area (First Contact) can be explained. The association of Patient Enablement with lower hospital outpatient visits and higher FD contracting (Quantitative) is supported by the qualitative explanation that improved experience and perceived "quality of care" lead to a preference for PHC. Indirectly, better diagnostic accuracy improves health, potentially reducing hospital use.

OR: Odds Ratio.
AOR: Adjusted Odds Ratio.
EQ VAS: European Quality of Life Visual Analogue Scale.
The bolded text indicates areas where qualitative and quantitative data mutually verify each other.
General Hospital Utilization/Visits/Rates are generally considered negative health service outcomes, hence lower values (OR/AOR < 1) indicate positive service impact.
Rate of Poor Glycemic Control is a negative health outcome, hence lower values (OR < 1) indicate positive service impact (better control).**Note:** PC: Primary Care.

these findings. The first is content validity. When international instruments like the PCAT presuppose a "gatekeeping" function (e.g., items asking if patients "must seek a GP first"),[11] they fail to capture the Chinese reality of "voluntary guidance." High scores on such misaligned dimensions may artificially inflate the perceived quality of service. The second issue is the significant heterogeneity and potential bias in quantitative data. This stems from China's vast regional disparities[86] and the inherent complexity of measuring multifaceted service processes.[87] Furthermore, PREMs often act as a "mirror" of subjective experience, susceptible to selection bias.[10] For instance, our previous work in Shanghai indicated that patients dissatisfied with primary care often bypass it entirely; thus, surveys conducted within CHCs primarily capture satisfied users, leading to an overestimation of "Comprehensiveness".[15,21]

Given the limitations of quantitative measurement, examining the mechanisms linking features to outcomes becomes crucial—an approach mirroring the foundational work of Starfield and Shi.[2,88] By synthesizing 15 years of evidence, this review confirms that China's primary care services possess significant potential to improve population health, experience, and cost-efficiency. Although drawing largely from cross-sectional data, the consistency across studies—triangulated by qualita-

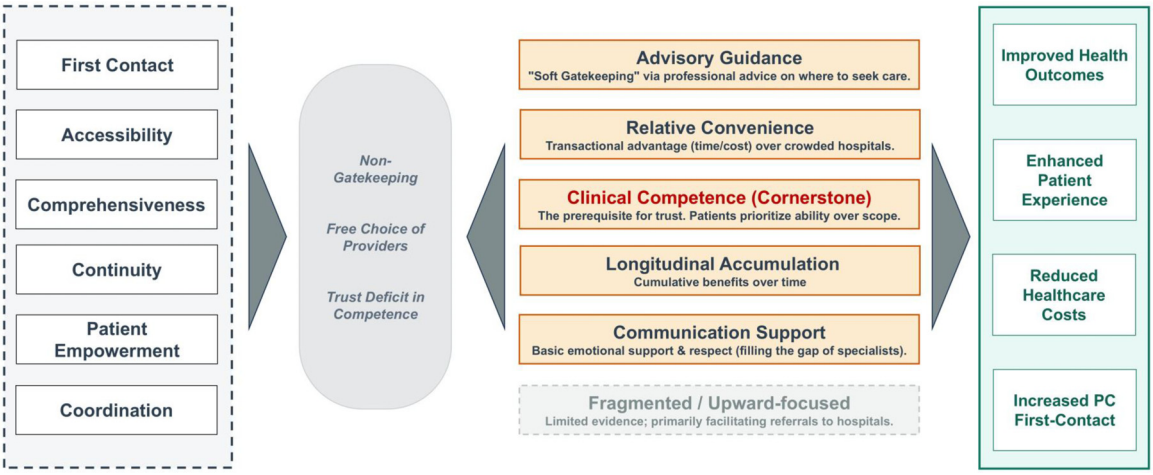

Fig. 2. The functional reconfiguration of primary care features in China's non-gatekeeping context.

tive insights—validates the value of sustained government investment in primary care since the 2009 reform.

However, the specific pathways triggering these outcomes differ from Starfield's classic model. As illustrated in Fig. 2, structural factors—specifically the non-gatekeeping system and the trust deficit in primary care competence—act as a filter, reconfiguring standard functional features into context-specific mechanisms. We identify five distinct pathways through which this reconfigured model drives health outcomes:

Pathway 1: Reconfigured "First Contact" — Advisory Guidance. Instead of mandatory gatekeeping, "First Contact" manifests as "Advisory Guidance". GPs act as professional guides, providing triage advice to patients navigating an open medical market. This "soft gatekeeping" compensates for the lack of a formal referral system, reducing inefficient hospital use and preventing delays due to patient self-misdiagnosis.

Pathway 2: Context-Dependent "Accessibility" — Relative Convenience. In China, "Accessibility" operates as "Relative Convenience." In resource-scarce rural areas, it retains its original function of basic availability. However, in urban centers with dense medical resources,[19] it narrows to a transactional advantage (e.g., proximity, shorter wait times) over crowded large hospitals. It serves as a competitive lever to attract patients rather than a guaranteed entry point.

Pathway 3: "Comprehensiveness" — Clinical Competence as the Cornerstone. Unlike Western contexts where provider competence is often assumed,[89,90] in China, "Clinical Competence" is the practical core of comprehensiveness (Fig. 2). Evidence indicates that patients prioritize perceived clinical ability over service scope.[15-17,32–36,52,61,73] Thus, clinical competence—not just accessibility[91]—serves as the prerequisite for trust and the cornerstone of effective primary care in this context.

Pathway 4: "Patient Empowerment" — Communication Support. Currently, empowerment manifests primarily as "Communication Support"—basic emotional support and respectful interaction that fills the gap left by busy hospital specialists. While this "soft" interaction builds rapport, "advanced empowerment" (e.g., shared decision-making,[92] opportunistic preventive advice[93]) remains a critical area for future development.

Pathway 5: Continuity — Longitudinal Accumulation. Continuity acts as a mechanism of "Longitudinal Accumulation." Through long-term contracting and familiarity, continuity amplifies the benefits of the other features over time. Consequently, impacts such as cost savings and deep trust are cumulative outcomes dependent on the sustained intensity of the preceding features.[2]

Based on these findings, we propose five strategic priorities:

1. Develop context-sensitive metrics: Future research must transcend the direct translation of international tools. Priority should be given to developing localized instruments and utilizing longitudinal designs to rigorously verify the causal mechanisms linking functional features to outcomes.
2. Institutionalize the "Navigator" role: Policies should leverage "Advisory Guidance" (Pathway 1) as a strategic entry point. Positioning family doctors as professional guides—rather than just providers—is a practical lever to enhance patient engagement and operationalize tiered diagnosis in a non-gatekeeping system.
3. Anchor "Comprehensiveness" in clinical competence: Enhancing quality requires shifting focus from broadening service scope to deepening diagnostic and treatment ability (Pathway 3). Education, guidelines, and payment incentives must be realigned to support this "competence-first" approach.
4. Operationalize "Patient Empowerment": Practice should evolve from basic communication support to structural empowerment. Piloting evidence-based interventions—such as shared decision-making and opportunistic preventive counseling—is essential to validate their real-world effectiveness in Chinese primary care.
5. Contextualize accessibility strategies: Policymakers should recognize the diminishing marginal returns of physical accessibility in resource-dense urban centers (Pathway 2). The focus in these areas must pivot towards service quality, while retaining basic accessibility as a priority only in underserved regions.

Our review is subject to four limitations. First, geographical bias limits generalizability; with two-thirds of qualitative studies originating from the economically developed Yangtze River Delta, findings may not fully capture the primary care reality in rural or western China. Second, substantial heterogeneity in quantitative data warrants cautious interpretation of the reported intensity levels. Third, data scarcity regarding specific features—particularly "Coordination"—constrained the depth of our mixed-methods integration. Finally, the reliance on cross-sectional designs and inconsistent measurement tools precludes definitive causal inferences; consequently, the reconfigured pathways proposed herein serve as evidence-based theoretical models requiring further validation through the longitudinal research outlined in our recommendations.

Conclusion

This review identifies six core functional features characterizing China's primary care services: Comprehensiveness, First Contact, Patient Empowerment, Accessibility, Continuity, and Coordination. While exhibiting medium-to-high intensity overall, these features have undergone significant functional reconfiguration compared to original theories. Crucially, stronger performance in these reconfigured features is

positively associated with superior health outcomes, enhanced patient experiences, cost containment, and reduced hospital utilization, with clear mechanistic pathways identified for five dimensions. These findings underscore the tangible value of China's sustained investment in primary care. They compel a dual focus for the future: policy interventions to further strengthen these specific features for better outcomes, and a research agenda dedicated to more precise, context-sensitive evaluation of this evolving primary care model.

Authors' other information

Not applicable.

Authors' contributions

Conceptualization, Y.W. and H.J.; Methodology, Y.W; Data curation, Y.W and H.J.; Formal analysis, Y.W.; Funding acquisition, Y.W, H.J, and D.Y; Project administration, D.Y.; Resources, D.Y; Supervision, D.Y; Validation, Y.W; Writing—original draft, Y.W.; Writing—review and editing, Y.W., H.Y, H.J, S.Y., and D.Y. All authors have read and agreed to the published version of the manuscript.

Ethical approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Funding

This research was funded by the 2024 Shanghai City Yangpu District Science and Technology and Economic Committee Deepening Medical Reform Innovation Research Project (Grant No. YPYG202403); the National Natural Science Foundation of China (Grant No. 72104183), and Shanghai Leading Talents Program (Grant No. YDH-20170627).

Availability of data and materials

Not applicable.

Declaration of competing interest

W.Y. and H.Y. are an editorial board members of the Chinese General Practice Journal but was not involved in the editorial review or the decision to publish this article. All authors declare no competing interests.

Acknowledgements

Not applicable.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.cgpj.2025.100088.

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