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Factors Influencing Home-based Volume Management in Patients with Chronic Heart Failure: A Qualitative Meta-synthesis Based on COM-B Model

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Article

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Abstract

Background

Home-based volume management of patients with chronic heart failure (CHF) is influenced by multiple factors. Grounded in the COM-B model, this study explores relevant influencing factors across three dimensions: capability, opportunity and motivation, and provides evidence for developing home-based volume management intervention programs for CHF patients.

Methods

A systematic literature search across PubMed, Cochrane Library, Embase, Web of Science, CINAHL, China National Knowledge Infrastructure (CNKI), Wanfang Databases from inception to June 30th, 2026. Eligible studies were extracted and thematically summarized and analyzed.

Results

A total of 18 studies were included. Thirty-two research findings were extracted, which were ultimately synthesized into 13 categories and synthesized into six integrated results: psychological capability (volume management knowledge and skills, cognitive dysfunction); physical capability (frailty, physical discomfort caused by volume management); reflective motivation (volume overload perception, self-efficacy); automatic motivation (habits and impulses, emotional drivers); physical opportunity (environmental constraints and support, re-source accessibility); and social opportunity (family, hospital, peers).

Conclusions

Home-based volume management behavior in CHF patients is influenced by the interactive effects of capability, opportunity, and motivation. The identification of the "opportunity-capability-behavior" enhancing pathway provides new targets for intervention. When developing intervention studies for home-based volume management in CHF patients, nursing teams should fully consider the dynamic relationships among these three dimensions and develop multidimensional, individualized nursing intervention programs.

Introduction

Chronic Heart Failure (CHF), as the end-stage of various cardiovascular diseases, is characterized by high prevalence, high mortality and high readmission rates, making it an urgent public health challenge worldwide [1]. The 2023 Global Burden of Disease Study reported that there were 56.1 million prevalent cases of CHF globally (95% UI: 50 million to 62.3 million), with a crude adult prevalence ranging from 1% to 3%. The risk of incident heart failure (HF) in adults aged ≥ 50 years is fourfold that in young and middle-aged populations, making older adults the predominant high-incidence group [2]. A meta-analysis indicates that CHF carries a dismal long-term prognosis, among hospitalized patients with heart failure, the 5-year all-cause mortality rate is nearly 50% [3].

Volume overload is a critical factor that directly induces or exacerbates clinical congestion symptoms in CHF patients, severely affecting prognosis and quality of life [4]. Volume overload, defined as pathological sodium and water retention leading to systemic tissue congestion, constitutes the primary modifiable trigger of acute CHF exacerbation, directly precipitating dyspnea, peripheral edema, pulmonary rales and impaired exercise tolerance [5–6]. These congestion-related symptoms represent the leading cause of unplanned hospitalizations and rehospitalizations among CHF patients [7]. Global data indicate that the 30-day readmission rate for heart failure is approximately 13.2%, while the one-year readmission rate reaches 35.7% [8]. Beyond hospital readmissions, persistent volume overload also triggers neurohormonal activation and progressive ventricular remodeling, ultimately accelerating disease progression and increasing long-term mortality [9].

Volume management is a crucial measure to control fluid retention, alleviate volume overload, relieve heart failure symptoms [10]. Current guideline-directed strategies encompass daily weight monitoring, dietary sodium restriction, fluid intake limitation, and diuretic titration based on volume status [11]. However, studies have shown that CHF patients have poor volume management behaviors after discharge, further exacerbating disease burden and increasing readmission risk [12].

Although guidelines recommend sodium and fluid restriction for volume management, their implementation faces considerable challenges, particularly in older populations [13]. For instance, a study of 103 elderly patients with CHF found that the correct performance rate for identifying high-sodium foods was only 39.8% [14]. Furthermore, contemporary evidence has prompted a re-evaluation of these traditional strategies. The FRESH-UP study demonstrated that stable HF patients do not require stringent daily fluid restriction and may maintain intake within a physiological range, whereas for patients with severe fluid overload or hyponatremia, fluid restriction of 1.5-2.0 L/day remains indicated [10, 11, 15]. Diuretics remain the cornerstone of decongestive therapy by promoting renal excretion of excess sodium and water, thereby directly reducing intravascular and extravascular volume [10]. However, the multicenter US CHAMP-HF registry showed that 31.7% of heart failure patients were non-adherent to their medication regimen [16]. Patients stated that although diuretics are essential medications,

they can cause troubles such as frequent urination, disrupted daily routines and social embarrassment [17]. Among non-pharmacological interventions, daily weight monitoring is the most feasible and widely recommended self-management tool. Guidelines recommend prompt intervention when body weight increases by more than 2 kg over 3 days [11]. Despite that, adherence to daily weight monitoring remains suboptimal in clinical practice. Patients who had been followed by specialist HF nurses for 12 months, the adherence rate to daily weighing using a paper logbook was only 36%; after switching to an alert-enabled mobile app, adherence improved to 59% [18].

Home-based volume management (HBVM) among CHF patients remains at moderate-to-low levels, with widespread negative management experiences that severely undermine the clinical benefits of guideline-recommended volume control strategies [19]. Systematically unpacking the multi-layered barriers and facilitators shaping patients' HBVM behaviors is critical to constructing targeted, patient-centered behavioral intervention protocols and optimizing long-term disease prognosis. Existing studies have identified numerous factors interfering with HBVM among CHF patients [20, 21]. However, most previous cross-sectional or qualitative studies have adopted unstructured descriptive analyses without a unified theoretical framework, making it difficult to systematically categorize barriers or interpret the dynamic interplay among influencing factors. Few studies have integrated all internal and external driving factors into a complete theoretical framework, leading to fragmented intervention targets and insufficient theoretical support for the design of clinical nursing protocols.

Capability-Opportunity-Motivation-Behavior (COM-B) model, proposed by Michie et al. in 2011 [22], serves as the core component of the Behavior Change Wheel (BCW) and is used to systematically analyze the key determinants of behavior. The model posits that for any behavior (B) to occur, three necessary conditions—capability (C), opportunity (O), and motivation (M)—must be simultaneously present. The three core elements are interdependent and interact dynamically [23]: on the one hand, sufficient opportunity and adequate capability can positively reinforce individual behavioral motivation and enhance behavioral persistence; on the other hand, strong behavioral motivation can prompt individuals to actively explore external resources, compensate for their capability deficits, and overcome some environmental and capability limitations. Meanwhile, the occurrence and repeated practice of behavior can also exert reciprocal effects on the three elements, continuously reshaping individual capability, adapting environmental opportunities, and solidifying behavioral motivation. Widely applied to analyze self-care barriers for chronic conditions including diabetes and hypertension, the COM-B model enables researchers to identify modifiable intervention targets and link theoretical analysis to tailored behavioral intervention development [24–27]. Within the field of HF self-management, several small-sample single-center qualitative studies have preliminarily utilized COM-B to explore volume management obstacles among elderly CHF patients, yet these studies cannot capture the full spectrum of influencing factors across diverse cultural backgrounds, healthcare systems and age subgroups [28–30].

Against these backdrops, this study adopts the systematic qualitative meta-synthesis method to comprehensively analyse factors influencing HBVM behaviours among patients with CHF. The synthesized findings are further categorised and interpreted using the COM-B theoretical framework, aiming to identify key barriers and facilitators of HBVM and provide theoretical and empirical evidence for developing targeted intervention strategies.

Methods

3.1. Study Design

This study adopted a systematic qualitative meta-synthesis design to synthesize existing qualitative evidence regarding factors influencing home-based volume management (HBVM) among patients with chronic heart failure (CHF). This design overcomes the limitation of simply summarizing findings from primary studies. The thematic synthesis proposed by Thomas and Harden as the specific synthesis strategy, which consists of three progressive stages [31]: line-by-line coding of findings from primary studies, inductive development of descriptive themes, and generation of analytical themes beyond the original texts. The COM-B behavior model is used as the theoretical framework [22]. This model summarizes the core elements of behavior change into three dimensions: Capability, Opportunity and Motivation, providing clear theoretical guidance for systematically identifying and classifying the influencing factors of home-based volume management behaviors. This study is reported in accordance with the PRISMA 2020 statement (Supplementary Material S1) [32] and the ENTREQ reporting standard (Supplementary Material S2) [33].

3.2. Inclusion and Exclusion Criteria

Inclusion criteria were established based on the SPIDER framework [34]: (1) Sample: Clinically diagnosed adult patients (≥ 18 years old) with CHF who live at home and perform self-management of volume status; (2) Phenomenon of Interest: Patients' experiences, perceptions, and behavioral influencing factors of home-based volume management, including but not limited to symptom monitoring, fluid intake restriction, weight management, adherence to diuretics and other medications; (3) Design: Original studies adopting qualitative research methods, such as phenomenology, grounded theory, ethnography, descriptive qualitative research, etc. Data collection methods include in-depth interviews, semi-structured interviews, focus group interviews, participant observation and so on; (4) Evaluation: Studies reporting experiences,

perceptions, cognitions, behavioral facilitators or barriers of home-based volume management among CHF patients, with sufficient qualitative data to support the research findings; (5) Research type: Original qualitative studies.

Exclusion Criteria: (1) mixed-methods studies from which qualitative data cannot be independently extracted; (2) solely collecting data from caregivers/medical staff without patient narratives; (3) research conducted in hospital settings rather than home/community environments.

3.3. Search Strategy

A systematic search was conducted in PubMed, Cochrane Library, Embase, Web of Science, CINAHL, China National Knowledge Infrastructure (CNKI), Wanfang Database. The search timeframe was set from the inception of each database to June 30th 2026.

The search terms were formulated based on three core themes: population (chronic heart failure patients), behavior (home-based volume management, fluid management, weight monitoring, sodium restriction, self-management of volume overload), and study type (qualitative research, interview, focus group, phenomenology, grounded theory, thematic analysis). Synonymous terms and MeSH terms were combined with free-text words using Boolean operators (AND/OR) to optimize search comprehensiveness. Reference lists of included studies and relevant systematic reviews were manually screened to supplement potential eligible literature and reduce retrieval bias. Search strategies for each database are detailed in Supplementary Material S3-S9.

3.4. Study Screening and Data Extraction

All retrieved records (n = 886) were exported to NoteExpress software for deduplication and management. Two independent reviewers (S.Z. and L.L.Z.), both with prior training in evidence-based methodology, screened the titles and abstracts of all retrieved records against the prespecified inclusion criteria. Potentially eligible records were then retrieved in full text, and the same two reviewers independently assessed each full-text report for eligibility. Disagreements at either stage were resolved through discussion; if consensus could not be reached, a third reviewer (H.L.C.) was consulted and made the final decision. The reasons for excluding full-text articles were documented and are presented in the PRISMA flow diagram (Fig. 1) [35].

Two researchers (S.Z. and L.L.Z.) independently extracted data from the included studies and cross-checked the results to ensure data accuracy. A standardized data extraction form was pre-designed, and the extracted contents included: (1) basic study information (first author, year of publication, country/region, journal name); (2) characteristics of study participants (sample size, gender composition, age range or median age, cardiac function classification or left ventricular ejection fraction, disease course); (3) methodological characteristics of studies (type of study design, data collection methods, data analysis methods, theoretical framework if available); (4) key study findings related to home-based volume management (theme names extracted from original studies, theme descriptions, and the most representative patient quotations); (5) statements of specific influencing factors associated with each dimension of the COM-B model; (6) results of study quality assessment.

3.5. Quality Evaluation

The methodological quality of the included literature was evaluated using the Critical Appraisal Skills Programme Qualitative Checklist (CASP) [36]. This scale consists of 10 items, each of which is rated on a three-point scale of "Yes", "No" or "Unclear".

Two researchers (S.Z. and L.L.Z.) independently completed the quality assessment for all included studies and cross-checked the assessment results. Any discrepancies were resolved through discussion until a consensus was reached; if no agreement could be achieved, a third researcher (H.L.C.) would make the final decision. CASP scores were not used to exclude any studies; instead, they served as input information for the methodological limitations in the CERQual assessment [37]. All studies meeting the inclusion criteria were retained for the final synthesis. Quality ratings of individual studies will be summarized in the final report, and the discussion section will explore how the overall methodological quality of the studies influences the confidence in the synthesized findings.

3.6. Data Synthesis

Data synthesis was performed using Thomas and Harden's thematic synthesis method [31], followed by theory-driven analysis guided by the COM-B model [22]. The synthesis process consisted of the following three stages, which were independently carried out by two researchers (S.Z. and L.L.Z.) with regular cross-checking:

Stage 1: line-by-line coding. Both researchers independently read the "Results" or "Findings" sections of each included study, extracting initial codes from each meaningful semantic unit while recording corresponding participant quotations as supporting evidence. Coding remained close to the original text, avoiding over-interpretation. Microsoft Excel was used to assist code management.

Stage 2: development of descriptive themes. Initial codes were compared, clustered, and organized into descriptive categories based on similarity and relevance. This stage remained anchored to the original studies' findings, summarizing what the primary studies reported

without introducing external theoretical interpretations. The two researchers exchanged and discussed their categorization schemes until consensus was reached.

Stage 3: generation of analytical themes. Descriptive themes were systematically mapped onto the three core dimensions of the COM-B model [22]: psychological capability (mental/cognitive capacities of patients); physical capability (patients' physical conditions and bodily experiences that enable or hinder volume-management behaviors); reflective motivation (conscious, deliberative cognitive evaluations and beliefs that drive behavior); automatic motivation (impulsive, emotion-driven or habit-based influences); physical opportunity (external material and environmental circumstances that facilitate or impede behavior); social opportunity (interpersonal and systemic social influences).

Through iterative discussion and conceptual mapping, fragmented findings from individual studies were integrated into a unified theoretical framework. The research team held bi-weekly meetings to review coding consistency and validate theme emergence, ensuring that final themes were both grounded in raw data and possessed theoretical integrative value.

3.7. Trustworthiness of the Synthesis

To ensure the methodological rigor and result credibility of this study, the following strategies were adopted:

(1) **Investigator triangulation.** Two researchers (S.Z. and L.L.Z.) independently performed literature screening, quality appraisal, coding, and thematic development. Regular comparison and discussion minimized the impact of personal bias.

(2) **Reflexive journaling.** All researchers maintained personal reflective logs from the outset of the study, documenting their academic backgrounds, clinical experience, pre-existing perspectives on volume management, and key analytical decisions with their rationales.

(3) **Audit trail.** The full-chain derivation records from original study citations, initial codes, descriptive themes, analytical themes were completely preserved, including the evolution of the coding scheme, decision records for theme merging and splitting, and minutes of research team discussions.

(4) **Peer debriefing.** Regular team meetings were held to debate ambiguous findings, theme inter-relationships, and COM-B model fit. When necessary, external researchers not directly involved in the analysis were invited to review the thematic framework and provide independent feedback, strengthening the robustness and credibility of the results.

3.8. Ethical Considerations

As this study involved secondary analysis of previously published qualitative data, no direct participant contact was undertaken; therefore, institutional review board approval and informed consent were not applicable. All data extracted from the included studies had been subjected to ethical review and approval by the respective original authors' institutions. Confidentiality and data security were maintained through standard data protection procedures.

Results

3.1. Characteristics of Included Studies

The initial search yielded 886 records. After removal of duplicates and title and abstract screening, full-text articles were assessed for eligibility, of which 18 met the inclusion criteria [30, 38–54]. The study selection process is illustrated in a PRISMA flow diagram (Fig. 1).

Of the 18 included studies, one was an unpublished Chinese master's thesis [41]. It was retained in the synthesis because it met all pre-defined eligibility criteria and provided rich original qualitative patient-reported data relevant to our research question. The remaining 17 studies were peer-reviewed publications issued between 2008 and 2026. The majority of included studies were published after 2020 (n = 12, 66.7%), reflecting growing research interest in home-based volume management (HBVM) among chronic heart failure (CHF) populations in recent years. The studies originated from countries including China (n = 13) [30, 38, 41–45, 47, 48, 50–52, 54], the United States (n = 3) [39, 46, 49], Norway(n = 1) [40], and South Korea(n = 1) [53].

All 18 included studies employed qualitative research designs. The most commonly used methodologies were descriptive qualitative research (n = 9) [30, 38, 40, 43, 44, 46, 48, 49, 51] and phenomenology (n = 6) [41, 45, 47, 50, 52, 54], with the remaining three studies utilizing grounded theory [39], qualitative cross-sectional design [53] and user persona methodology [42]. Sample sizes ranged from 9 to 82 participants, with a total of 358 participants across all studies. Participants were predominantly older adults (mean age range: 56–76 years) with New York Heart Association (NYHA) functional class II–III heart failure, reflecting the typical demographic of CHF populations requiring home-based volume management. The key characteristics of the included studies are summarized in Table 1.

Table 1
Characteristics of Included Studies

Included Studies	Country	Participants	Methodology	Theoretical Framework	Phenomenon of Interest	Main Findings
Xu et al. (2025) [38]	China	19 older CHF patients with multimorbidity (≥ 60 years, NYHA II-IV)	Descriptive qualitative design	Consolidated Framework for Implementation Research (CFIR)	Facilitators and barriers to self-volume management in older patients with CHF and multimorbidity	Identified 8 facilitators (hospital-community collaboration, Medicare/LTC insurance, social support, digital health management, etc.) and 9 barriers (lack of standardized tools, inadequate multidisciplinary communication, one-way doctor-patient communication, physical limitations, behavioral habit consolidation, etc.)
Sevilla-Cazes et al. (2018) [39]	USA	31 HF patients (readmission group and post-index admission group, mean age 59 years)	Observational qualitative study; grounded theory approach	None explicitly stated	Home management challenges and reasons for hospital readmission	Identified two cycles: "limit testing" (uncertainty + temporal incongruence → decreasing adherence) and "despair" (hopelessness from treatment failure → worsening adherence)
Nordfonn et al. (2020) [40]	Norway	17 HF patients (18–75 years, NYHA II-III)	Descriptive qualitative design	Burden of Treatment (BoT) Theory	Patient capacity to manage treatment and self-care burdens	Identified 3 themes: Personal characteristics, Coping strategies, and Emotional and informative support
Zhang (2016) [41]	China	9 CHF patients who received weight management ≥ 1 year (8 male, 1 female, age 47–81 years)	Phenomenological qualitative study	None explicitly stated	Implementation status and problems of weight management in CHF patients	Identified 5 themes of good implementation (early symptom perception via weight gain, belief in WM benefits, proficient diuretic use, fluid restriction adherence, family reminders) and 4 problems (insufficient belief, adverse life events, cognitive errors and knowledge forgetting, overly complex content)
Li et al. (2026) [42]	China	15 elderly CHF outpatients (≥ 60 years, NYHA I-III)	Qualitative user persona study	Qualitative User Persona (methodological framework)	Attitudes and behaviors toward volume management in elderly CHF patients	Constructed 4 typical personas: Care free type, Powerless type, Disciplined and self-regulated type, and Overly responsive type
Yu et al. (2025) [43]	China	12 CHF patients (≥ 18 years, smartphone users)	Descriptive qualitative design	Patient Journey Map (methodological framework)	Multidimensional needs in volume management across the patient journey	Created a patient journey map across 3 stages (diagnosis/evaluation, hospitalization, long-term management) with 14 themes from three dimensions: tasks, emotions, and pain points; revealed dynamic and interwoven needs throughout the disease trajectory
Lu et al. (2025) [44]	China	20 CHF patients (≥ 18 years, NYHA II-IV)	Descriptive qualitative design	Pender's Health Promotion Model (HPM)	Influencing factors of home fluid intake management in CHF patients	Extracted 2 themes with 8 sub-themes: Facilitators (perceived benefits, proactive health behaviors, self-efficacy, increased self-care time commitment) and Barriers (poor home coping behaviors, memory loss, negative cognition and

Included Studies	Country	Participants	Methodology	Theoretical Framework	Phenomenon of Interest	Main Findings
						delayed medical care, weakened internal and external support)
Yu et al. (2024) [30]	China	15 elderly CHF patients (≥ 60 years)	Qualitative descriptive study	COM-B (Capability-Opportunity-Motivation-Behavior) Model	Behavioral experience of home volume overload management in elderly CHF patients	Extracted 3 themes and 9 sub-themes: Capability (poor symptom perception, knowledge deficiency/deviation, ineffective home management response), Motivation (poor management experience, low exercise self-efficacy, lack of confidence), Opportunity (hospital support, community support, family support)
Qiao et al (2023) [45]	China	12 elderly CHF patients (≥ 60 years, discharged ≥ 3 months)	Phenomenology	Integrated Theory of Health Behavior Change (ITHBC)	Home volume management experience in elderly CHF patients	Identified 4 themes: (1) inadequate awareness of volume management, (2) negative beliefs due to aging mentality, (3) lack of knowledge and skills for volume regulation, (4) multiple social support needs
Meraz et al. (2022) [46]	USA	82 HF patients taking diuretics (mean age 64.9 years, readmitted within 90 days)	Descriptive qualitative approach	Transactional Theory of Stress and Coping (TTSC)	Diuretic adherence experiences and coping with medication-related stress	Adherent participants appraised diuretics as "bothersome" but stayed positive amid hardship and adapted to endure; non-adherent participants lacked positive coping mechanisms; positive emotions sustained adherence despite perceived negative effects
He et al (2019) [47]	China	10 CHF patients (NYHA III-IV, mean age 65 years)	Phenomenological qualitative study	Theory of Planned Behavior (TPB)	Influencing factors of weight management behavior in CHF patients	Identified 5 themes: (1) lack of disease knowledge, (2) evaluation of behavioral outcomes, (3) self-belief, (4) patient role conflict (work vs. management), (5) family and social support
Rong et al. (2017) [48]	China	15 older HF patients (≥ 60 years, NYHA II-IV)	Qualitative descriptive design	Leininger's Sunrise Model (Transcultural Nursing)	Cultural factors influencing dietary and fluid restriction behaviors	Identified 7 cultural themes: attitudes concerning health and illness, customary way of life, kinship and social ties, religion, financial concerns, education level, and use of folk care/TCM system
Sheahan et al. (2008) [49]	USA	33 older women (65–98 years, with HTN or HF, residing in congregate living facilities)	Qualitative descriptive design	None explicitly stated	Sodium-restricted diet adherence knowledge, decision-making, and barriers in older women	Identified key themes: "eating alone" as a contextual barrier to healthy nutrition; lack of SRD education by healthcare providers; desire for more information; motivation from concern for family; lack of knowledge and lack of HCP education/counseling
Ju et al (2014) [50]	China	18 CHF patients who participated in weight	Phenomenological qualitative study	Reinforcement Theory (Skinner)	Long-term compliance to weight management and	Identified 3 themes: precipitating factors (correct disease perception, self-efficacy); positive reinforcement

Included Studies	Country	Participants	Methodology	Theoretical Framework	Phenomenon of Interest	Main Findings
		management ≥ 6 months			influencing factors	factors (early benefits, readmission, follow-up, family and social support); negative reinforcement factors (long-term non-benefit, physical and mental disorders)
Tang et al (2025) [51]	China	12 CHF patients with ≥ 1 poor volume management behavior (55–72 years)	Descriptive qualitative research	COM-B (Capability-Opportunity-Motivation-Behavior) Model	Behavioral determinants of volume management in CHF patients	Extracted 3 behavioral determinants: Capability (cognitive deficiency, weak execution ability, limited diet structure optimization), Opportunity (limited medical resource accessibility, imperfect social support system), Motivation (insufficient automatic drive, lack of reflective drive)
Ma et al(2023) [52]	China	14 CHF patients (stable CHF, age 23–82 years)	Phenomenological study	Interpretative Phenomenological Analysis (IPA)	Thirst symptom experience and coping strategies in CHF patients	Identified 4 themes: emotional reactions, thirst discomfort, poor volume management ability, and coping strategies; thirst distress
Heo et al. (2021) [53]	South Korea	22 HF patients + 18 caregivers	Qualitative cross-sectional study	None explicitly stated	Dietary sodium adherence experiences from patients' and caregivers' perspectives	Identified 4 themes: (1) lack of adherence to low-sodium diet, (2) barriers (distorted perceptions, insufficient knowledge, distaste, lack of family support), (3) facilitators (changed eating habits, family support), (4) distorted perceptions of dietary education from healthcare providers
Wang et al. (2025) [54]	China	12 CHF patients (28–76 years, hospitalized)	Descriptive phenomenological analysis	None explicitly stated	Real-life experiences of volume management in CHF patients	Identified 4 themes: (1) symptom distress leading to changes in daily behavior, (2) barriers to implementing volume management behaviors, (3) low awareness, (4) lack of knowledge

The synthesis of the 18 qualitative studies demonstrated that patients' capability, opportunity, and motivation collectively shape home-based volume management behaviors (Table 2). Social opportunity was reported in all included studies, followed by psychological capability (17/18, 94.4%) and physical opportunity (17/18, 94.4%). Physical capability and reflective motivation were explored in 16 studies (88.9%), whereas automatic motivation was addressed in 14 studies (77.8%). This distribution suggests that while all three COM-B components are pertinent to understanding home-based volume management (HBVM), the emphasis placed on each varies across studies, likely reflecting differences in research objectives and patient populations.

Table 2
Mapping of Included Studies to the COM-B Model Dimensions

Included Studies	Psychological Capability	Physical Capability	Reflective Motivation	Automatic Motivation	Physical Opportunity	Social Opportunity
Xu et al. (2025) [38]	√	√	√	√	√	√
Sevilla-Cazes et al. (2018) [39]	√	√	√	√	√	√
Nordfonn et al. (2020) [40]	√	√	√	√	×	√
Zhang (2016) [41]	√	√	√	√	√	√
Li et al. (2026) [42]	√	×	√	√	√	√
Yu et al. (2025) [43]	√	√	√	√	√	√
Lu et al (2025) [44]	√	√	√	√	√	√
Yu et al (2024) [30]	√	√	√	√	√	√
Qiao et al (2023) [45]	√	√	√	√	√	√
Meraz et al. (2022) [46]	√	√	√	√	√	√
He et al (2019) [47]	√	√	√	√	√	√
Rong et al. (2017) [48]	√	√	√	×	√	√
Sheahan et al. (2008) [49]	√	×	×	×	√	√
Ju et al (2014) [50]	√	√	√	√	√	√
Tang et al (2025) [51]	√	√	√	√	√	√
Ma et al(2023) [52]	×	√	×	√	√	√
Heo et al. (2021) [53]	√	√	√	×	√	√
Wang et al. (2025) [54]	√	√	√	√	√	√

3.2 Quality Assessment Results

Among the 18 included studies, 12 were met all CASP items (10/10), 6 were marked as Unclear only for Item 6 (reflection on the researcher-participant relationship), with all other items met (9/10).All studies adequately represented participants and their voices (Item 9). The detailed quality appraisal results for each study are presented in Table 3.

Table 3
Methodological Quality Assessment of Included Studies (CASP Qualitative Checklist) [36]

Included Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
Xu et al. (2025) [38]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Sevilla-Cazes et al. (2018) [39]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Nordfonn et al. (2020) [40]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Zhang (2016) [41]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Li et al. (2026) [42]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Yu et al. (2025) [43]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Lu et al (2025) [44]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Yu et al (2024) [30]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Qiao et al (2023) [45]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Meraz et al. (2022) [46]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
He et al (2019) [47]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Rong et al. (2017) [48]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Sheahan et al. (2008) [49]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Ju et al (2014) [50]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Tang et al (2025) [51]	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	9/10
Ma et al(2023) [52]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Heo et al. (2021) [53]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10
Wang et al. (2025) [54]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/10

Notes: Y = Yes; N = No; U = Unclear. Q1 = Clear statement of research aims; Q2 = Appropriate qualitative methodology; Q3 = Appropriate research design; Q4 = Appropriate recruitment strategy; Q5 = Appropriate data collection; Q6 = Consideration of researcher-participant relationship; Q7 = Ethical issues considered; Q8 = Rigorous data analysis; Q9 = Clear statement of findings; Q10 = Value of research.

3.3. CERQual Assessment of Synthesized Findings

The confidence in each synthesized theme was assessed using the GRADE-CERQual approach [37], based on four components: methodological limitations, coherence, adequacy of data, and relevance. As presented in Table 4, reflective motivation and social opportunity were rated as high confidence, while psychological capability, physical capability, automatic motivation, and physical opportunity were rated as moderate confidence.

The primary reason for downgrading to moderate confidence was methodological limitations, the lack of explicit researcher reflexivity (Item 6 of the CASP checklist), which was poorly reported in the majority of the included studies. For automatic motivation and physical opportunity, minor coherence issues due to contextual variation in how certain concepts were defined and emphasized across studies also contributed to the downgrading. Notably, no theme was downgraded for adequacy of data or relevance, as all synthesized findings were supported by rich data from multiple studies and were directly applicable to the research question of home-based volume management in CHF patients.

Table 4
CERQual Assessment of Synthesized Findings

Synthesized Theme	CERQual Confidence	Methodological Limitations	Coherence	Adequacy of Data	Relevance	Explanation of Assessment
1. Psychological Capability	**MODERATE**	Minor concerns: Reflexivity poorly reported in most studies.	No concerns: Highly coherent; patients consistently reported knowledge deficits and memory issues.	No concerns: 14 studies provided rich descriptions of knowledge gaps and cognitive failures.	No concerns: Directly relevant to psychological capability.	Confidence **moderately** downgraded due to methodological limitations (lack of reflexivity).
2. Physical Capability	**MODERATE**	Minor concerns: Variable reporting of physical symptoms; lack of reflexivity.	No concerns: Strong consistency; thirst and diuretic-related physical discomfort repeatedly cited as significant barriers.	Minor concerns: Adequate but variable depth of description on physical frailty.	No concerns: Directly relevant to physical capability.	Confidence **moderately** downgraded due to minor methodological limitations.
3. Reflective Motivation	**HIGH**	Minor concerns: Some studies lacked explicit researcher reflexivity (Item 6).	No concerns: Excellent coherence; symptom perception and self-efficacy consistently linked to adherence.	No concerns: Very rich data from 16 studies with detailed narratives.	No concerns: Directly aligns with reflective motivation.	Confidence **not downgraded**. Strong coherence, abundant data, and high relevance outweigh minor methodological limitations.
4. Automatic Motivation	**MODERATE**	Minor concerns: Reflexivity poorly reported.	Minor concerns: Habits were inconsistently defined across cultural contexts.	Minor concerns: Data on emotional drivers adequate; data on habit	No concerns: Directly relevant to automatic motivation.	Confidence **moderately** downgraded due to coherence issues (habits defined variably) and methodological limitations.
5. Physical Opportunity	**MODERATE**	Minor concerns: Lack of reflexivity.	Moderate concerns: Inconsistent emphasis on barriers vs. facilitators across different contexts.	No concerns: Sufficient data from 13 studies.	No concerns: Directly relevant to physical opportunity.	Confidence **moderately** downgraded due to coherence issues (contextual variation) and methodological limitations.
6. Social Opportunity	**HIGH**	Minor concerns: Reflexivity issues.	No concerns: Extremely strong coherence; all 18 studies uniformly identified social support as a pivotal factor.	No concerns: Very rich and abundant data from all 18 studies with detailed patient quotations.	No concerns: Directly relevant to social opportunity.	Confidence **not downgraded**. Exceptional coherence, overwhelming data adequacy, and perfect relevance warrant a high confidence rating.

Notes: CERQual = Confidence in the Evidence from Reviews of Qualitative research. Methodological Limitations drew from CASP results (Table 3), with particular attention to researcher reflexivity (Items 6). Coherence assessed consistency of findings across studies. Adequacy of Data determined by richness and quantity of data. Relevance evaluated based on applicability to home-based volume management in CHF patients. Confidence levels were assigned according to the GRADE-CERQual approach [37].

3.4. Thematic Synthesis Findings

A total of 32 clear research findings were extracted from the 18 included qualitative studies. Through inductive merging, these were organized into 13 categories, and ultimately synthesized into 6 integrated themes according to the COM-B model: (1) Psychological capability (knowledge and skills, cognitive dysfunction); (2) Physical capability (frailty, physical discomfort); (3) Reflective motivation (volume overload perception, self-efficacy); (4) Automatic motivation (habits, emotional drivers); (5) Physical opportunity (environmental factors, resource accessibility); (6) Social opportunity (relatives and friends, medical institutions, peer patient). The correspondence between the synthesized results and their specific connotations are presented in Table 5.

Table 5
Themes, categories and findings derived from the thematic synthesis.

Integrated Theme (COM-B)	Category	Research Findings
Theme 1. Psychological Capability	Knowledge and skills	(1) Lack of volume management knowledge;
		(2) Misconceptions about volume management;
		(3) Lack of practical management skills
	Cognitive dysfunction	(4) Memory decline;
		(5) Inattention;
		(6) Insufficient executive function
Theme 2. Physical Capability	Frailty	(7) Clinical symptoms caused by heart failure;
		(8) Multimorbidity
	Physical discomfort caused by volume management	(9) Thirst;
		(10) Troublesome side effects of diuretics
Theme 3. Reflective Motivation	Perception of volume overload	(11) Inadequate perception of volume overload symptoms;
		(12) Delayed healthcare-seeking behavior
	Self-efficacy	(13) Personal characteristics (intrinsic capacity, positive attitudes);
		(14) Reinforcement from successful management experiences;
		(15) Weakening effect from lack of perceived benefits
Theme 4. Automatic Motivation	Habits	(16) Unhealthy lifestyle habits;
		(17) Facilitation by material resources;
		(18) Facilitation by social opportunities
	Emotional drivers	(19) Emotional distress caused by the disease itself;
		(20) Emotional distress caused by poor treatment outcomes;
		(21) Discomfort during treatment process
Theme 5. Physical Opportunity	Environmental factors	(22) Work-related time constraints;
		(23) Financial constraints
	Accessibility of resources	(24) Availability of volume management tools;
		(25) Digital health technologies
Theme 6. Social Opportunity	Relatives and friends	(26) Driving positive emotions;
		(27) Driving self-efficacy;
		(28) Directly facilitating volume management
	Medical institutions	(29) Remote guidance from healthcare providers;
		(30) Hospital–community–family integrated care
	Peer patient	(31) Emotional catharsis through shared experiences;
		(32) Exchange of information and practical resources

Theme 1: Psychological Capability—The Knowledge Base of Volume Management Cognition and Execution

Category 1: Knowledge and Skills

Limited awareness of heart failure pathogenesis and fluid volume regulation constitutes a core individual-level barrier to effective self-monitoring among patients with chronic heart failure (CHF). Many patients fail to establish causal connections between daily physical indicators and disease progression: *"I do not think body weight is related to my disease"* [30]. This cognitive gap is not merely attributed to limited health literacy or endogenous cognitive deficits. Inaccurate health information acquired from informal social sources distorts patients' disease perceptions and induces maladaptive volume management behaviors: *"My blood is thick, and my neighbor told me that drinking plenty of water would help, so I consume excessive water daily"* [43].

Generalized and impersonal hospital health education hinders the translation of theoretical disease knowledge into practical daily selfcare strategies: *"during hospitalization, medical staff introduced fluid volume management knowledge, but the guidance was not tailored to my personal condition, and I still do not know how to conduct self-management"* [49]. Such inadequate, non-individualized health education support further impairs patients' practical ability to manage their daily diets. Even after receiving hospital-based education, many patients cannot translate general salt and fluid restriction principles into food selection decisions in real life scenarios: *"I have no idea which ingredients are high in salt and water "*[49]. Collectively, individual cognitive misconceptions, misinformation from non-clinical channels, and non-tailored institutional health education interact synergistically, undermining patients' capacity to implement evidence-based fluid and dietary self-management after hospital discharge.

Category 2: Cognitive Dysfunction

Cognitive dysfunction represents another prominent individual barrier to home-based volume management (HBVM) among CHF patients, many exhibit impairments in memory, attention, and executive function. As reflected in patients' self-reports, *"my responsiveness and memory have deteriorated"* [44]. Such cognitive deficits frequently result in poor adherence to volume management behaviors: *"I often forget to take my medicine and manage my condition when I am at work"* [35]. Moreover, patients tend to rapidly forget health education knowledge acquired during hospitalization, as one participant recalled: *"The doctor instructed me on daily water and salt intake for volume control at discharge, but I have already forgotten the details"* [49]. Volume management is a complex task, which includes assessing volume-overload status, calculating and regulating fluid balance, and adhering to standardized medication regimens, posing great challenges to patients: *"Long-term monitoring of disease changes is a considerable challenge for me"* [40].

Theme 2: Physical Capability—Constraints of Physical Status on Behavioral Execution

Category 3: Frailty

As a progressive clinical syndrome, heart failure commonly leads to systemic frailty: *"It (This disease) is like another type of cancer. I feel exhausted every single day"* [46]. Meanwhile, studies show that patients with heart failure have a high prevalence of comorbidities; 82% of them suffer from multiple chronic diseases, and 24% have five or more comorbidities [55]. Comorbid illnesses further hinder the implementation of standard volume management practices, as illustrated by the account: *"After discharge, I suffered from glaucoma and lost my eyesight in both eyes. My spouse was not around to help me check the readings, and there was no weighing scale at home, making daily weight monitoring completely impractical"* [48]. The interactive effects of multiple diseases and the complexity of conflicting treatment requirements additionally increase the difficulty of consistent volume management: *"I have gout, which requires adequate water intake. However, I am supposed to restrict my fluid consumption due to heart failure"* [40].

Category 4: Physical Discomfort Caused by Volume Management

When patients have obvious symptoms of water-sodium retention, strict restriction of fluid intake is required, whereas intensive fluid limitation frequently triggers severe thirst perception *"Dry mouth makes me irritable; the feeling of extreme thirst is indescribable and extremely unbearable"* [50]. Such intractable thirst often results in volume management failure: *"I cannot help drinking water when feeling thirsty, and I always lose control of my fluid intake"* [50]. Furthermore, routine anti-heart failure medications, including diuretics, antihypertensive drugs, and anticholinergic agents, can exacerbate thirst-related discomfort [56]. In addition, diuretic administration creates persistent disturbances to patients' daily lives, as reflected in patient narratives: *"I have to go to the toilet numerous times every day, and the frequent urination sometimes lasts throughout the night"* [44].

Theme 3: Reflective Motivation—Rational Cognition-Driven Behavioral Choices

Category 5: Perception of Volume Overload

Volume overload perception refers to patients' ability to monitor, recognize, and interpret the symptoms and signs of excessive fluid retention [7]. Adequate symptom perception enables patients to identify early disease deterioration and initiate timely self-interventions: *"I observe whether my feet are swollen at home to judge whether my condition has worsened"* [41]; *"My body weight increased by 0.7 kg within one day after discharge. I suspected excessive fluid accumulation and immedi-ately took hydrochlorothiazide"* [48]. In contrast, inadequate volume overload

perception may lead to unrecognized disease progression and delayed medical consultation: *"I did not notice my leg swelling at the beginning and did not take any medication. I only sought medical care until I suffered severe dyspnea and needed frequent rest after walking a short distance"* [42].

Category 6: Self-efficacy

Negative self-evaluation of individual self-management competence directly undermines treatment adherence and sustainable volume management behaviors. Patients with insufficient self-efficacy often struggle to maintain long-term behavioral compliance: *"I cannot stick to the rules. At my age, it is impossible to restrain myself with so many restrictions"* [43]. In comparison, patients with higher self-efficacy demonstrate stronger behavioral control and better volume management adherence: *"I believe I have the energy and willpower to perform fluid volume management"* [37]. Self-efficacy can be effectively reinforced through successful management experiences, as patients with sustained adherence described, *"I feel well currently and will continue to follow the medical instructions for fluid volume management"* [35]. Conversely, a lack of positive clinical feedback over time may weaken self-efficacy and induce a sense of powerlessness and behavioral abandonment: *"I kept weighing myself at home for three months but saw no changes, so I quit because I thought it was troublesome"* [48].

Theme 4: Automatic Motivation—Emotion- and Habit-Driven Automatic Responses

Category 7: Habits

Long-term behavioral patterns such as the patient's long-established diet and lifestyle exert a significant impact on patients' volume management at home. Patients perceive these deep-seated habits as difficult to modify: *"In my previous job, I went long-distance running and drank several bottles of green tea every day; it was hard for me to break this habit"* [35]; *"My eating habits are inherited from my grandparents and parents. Drunken crabs and salted conchs are the two most frequent dishes in my household, and I am very fond of them"* [46] Nevertheless, abandoning detrimental old habits and establishing adaptive new ones facilitates optimal volume management, as reflected by the participant's account: *"I have adapted to this lifestyle, taking medications on a daily schedule and monitoring my physical condition"* [40]. Accordingly, behavioral habits are modifiable. Integrating volume management strategies into routine daily life and fostering corresponding habits can not only alleviate patients' self-management burden but also promote better disease control.

Category 8: Emotional Influence

The prolonged progression of heart failure not only induces progressive physio-logical deterioration but also imposes substantial burdens on patients' psychosocial adaptation. Existing evidence indicates that approximately 30% to 70% of CHF patients experience comorbid anxiety and depression [57]. Severe psychological distress may even induce negative life perceptions: *"Sometimes I wish I could pass away early, so that my wife can enjoy her later life. I feel sorry for my family"* [46]. Patients report irritability and emotional agitation caused by intolerable thirst during volume management: *"When I feel thirsty, I become restless, agitated, and irritable, and I easily lose my temper"* [50]. Failed volume management further exacerbates negative affective responses, as reflected in patient self-statements: *"I feel very sad. I have tried to manage my disease, but my body is still filled with excess fluid"* [36]. Such negative emotional states significantly undermine internal motivation for maintaining healthy self-care behaviors, trigger doubts regarding therapeutic value, and lead to voluntary abandonment of treatment adherence.

Negative affective states can create a vicious cycle for heart failure self-care: emotional distress reduces patients' capacity for self-regulation, which in turn undermines adherence to salt and fluid restrictions, subsequently worsening fluid overload and physical symptoms, and further exacerbating psychological suffering. Routine physical assessment alone is insufficient for holistic volume-oriented care. Integrating psychological screening and emotional support into standard heart failure follow-up may help break this feedback loop and optimize long-term self-management performance.

Theme 5: Physical Opportunity—Support and Constraints of the Material Environment on Behavior

Category 9: Environmental Factors

Time scarcity and financial constraints constitute socioeconomic barriers to consistent and sustained volume management among CHF patients. Busy work schedules and limited daily time availability often prevent patients from adhering to routine self-management protocols and restrict long-term behavioral persistence. As working patients described practical dilemmas in daily care: *"I need to go to work at 8 o'clock every morning, so I have no time to weigh my body during busy mornings"* [30]; *"I recognize the benefits of salt restriction for relieving dry mouth, but I cannot control salt intake during external dining and social engagements"* [30]. In contrast, supportive environmental conditions serve as effective facilitators for sustained self-management engagement: *"I no longer work currently and have adequate spare time to recuperate and manage my condition properly"* [41]. Beyond time limitations, economic burdens further hinder the implementation of standardized dietary and

volume management. Patients with limited financial resources tend to prioritize economic affordability over dietary health standards: *"The diet recommended for disease management is expensive, so I choose the most affordable food available and try to save every penny"* [36].

Category 10: Resource Accessibility

Targeted management tools and technical auxiliary methods serve as effective supportive measures that can ameliorate physiological function impairments and help CHF patients proactively implement volume management: *"I run my business every day, weighing rice and oil. When I have nothing to do, I just stand there weighing myself"* [38]. Personalized reminder tools can offset patients' impaired memory and executive dysfunction, ensuring standardized self-care practices: *"I set phone alarms to remind myself to take medication, with alerts going off at 3 a.m. and 9 p.m. every day"*[44]. With the rapid development of the digital health industry, intelligent mobile terminals have further optimized the traditional modes of health education and patient self-management by providing intuitive, accessible and easy-to-operate health popular science content. Such digital health re-sources are particularly suitable for elderly patients suffering from poor eyesight and age-related cognitive decline: *"I have presbyopia and my mental processing has slowed down; I can barely read printed brochures, yet WeChat and Douyin allow me to access health information far more conveniently"*[35]. Smart wearable devices and mobile applications enable real-time physiological indicator monitoring, automatic health record generation, and intelligent medication reminder notifications, boosting patients' volume management capabilities: *"This fitness tracker is extremely useful. It synchronizes real-time health data to my mobile phone, making it easy for me to monitor various physical symptoms on a daily basis"*[35].

Theme 6: Social Opportunity—Shaping and Regulation of Behavior by Interpersonal Networks

Category 11: Relatives and Friends

Social support from relatives and friends can help CHF patients implement home-based volume management. They can provide direct behavioral support and daily supervision to facilitate compliant self-management. As one participant reported positive peer supervision during social dining: *"When I dine out with friends, they are concerned about my condition and advise me to avoid greasy and salty foods"* [35]. Furthermore, social companions compensate for patients' cognitive deficiencies and assist in sustaining effective volume management practices: *"I frequently forget many things, so my wife accompanies me to medical visits and remembers the health guidance that I fail to re-call"* [37]. Supportive familial relationships also reinforce patients' long-term health goal orientation and positive self-management willingness: *"I hope to witness my grandson's growth and live a long life, so I must take good care of my health"* [47]. In contrast, adverse social and familial environments may hinder HBVM and create behavioral dilemmas: *"My daughter-in-law cooks according to the family's taste and often stews meat soup for me. I recognize that excessive sodium intake is harmful, yet it is difficult for me to refuse her kindness"* [46].

Accordingly, establishing a structured family support system for CHF patients is crucial for facilitating effective home-based volume management. Family-centered self-care interventions should extend beyond behavioral supervision of patients. Integrating family caregivers into targeted health education enables caregivers to fully understand the dietary and fluid restrictions for heart failure management, thereby fostering a supportive home environment that promotes sustained adherence to evidence-based volume control strategies.

Category 12: Medical Institutions

Standardized professional guidance from medical staff constitutes a crucial clinical facilitator for strengthening patients' self-efficacy and adherence to HBVM. As one participant described the positive incentive of professional guidance: *"After discharge, I continue to monitor my heart rate and blood pressure daily and consult my doctor regularly following medical instructions. The doctor confirmed my favorable recovery, which greatly encourages me"* [40]. Medical supervision enhances patients' self-management initiative and standardizes daily self-care behaviors: *"After the medical staff visited my home, I told my wife that I should take self-management more seriously given the professional attention. Since then, I have consistently adhered to daily weight monitoring"* [48]. The collaborative hospital-community collaborative care model can effectively improve patients' self-management outcomes and provide long-term support for HBVM. One patient stated: *"Hospitals and community organizations have established long-term partnerships, and they regularly organize free medical consultations and health science popularization lectures"*[35]. Such collaborative mechanisms can not only effectively reduce the service burden on tertiary hospitals but also improve the overall utilization efficiency of medical resources.

Category 13: Peer Patient

Peer interaction based on shared disease experiences and identity recognition constitutes a valuable social facilitator for optimizing volume management among CHF patients. Mutual support among peers facilitates the exchange of disease-related knowledge and practical self-management experience: *"It is essential to have companions to discuss disease issues together; otherwise, I can hardly acquire any relevant knowledge on my own"* [43]. Peers with richer disease coping experience provide dual practical and emotional support for newly diagnosed or less experienced patients. Many patients regard peer companions as reliable partners for disease management: *"I treat my fellow patients as 'comrades-in-arms' and actively consult them for more experience, as they have lived with heart failure for a longer time"* [30]. Such peer support

broadens patients' access to disease management information and strengthens their self-efficacy and management confidence when confronting the uncertainty of chronic disease progression.

Discussion

4.1. The Dynamic Interaction Mechanism of Capability, Opportunity and Motivation (Fig. 2)

Through systematic meta-synthesis of 18 qualitative studies, this research identified six core determinants of home-based volume management (HBVM) behaviors among CHF patients, organized within the COM-B model framework [22]. These determinants do not operate in isolation; rather, they exert direct effects, indirect mediating effects, and reciprocal feedback effects that collectively shape patients' volume management behaviors. Grounded in the synthesized evidence, this section elaborates on the dynamic interaction mechanisms among capability, opportunity, and motivation (Fig. 2), extending the theoretical propositions of the COM-B model with context-specific insights from the CHF population.

At the most fundamental level, the COM-B model posits that behavior (B) occurs when capability (C), opportunity (O), and motivation (M) are simultaneously present [22, 23]. Capability is a necessary condition for behavioral implementation, and it serves as an internal factor that directly determines whether patients are capable of performing HBVM behaviors. Patients with insufficient disease awareness, declined cognitive function, or severe thirst and diuretic-induced discomfort exhibit poor behavioral adherence (Category 1-4) [30, 45, 50, 52]. Motivation governs the initiation and maintenance of health-related behaviors. Reflective motivation provides a rational basis for behavioral decision-making. Patients with sharp symptom perception can identify volume overload at an early stage and implement timely self-intervention (Categories 5-6) [48]. Automatic motivation functions through impulsive or habitual pathways. Patients who have established fixed management habits exhibit better adherence [47], whereas negative emotions such as anxiety, depression and frustration can undermine intrinsic motivation and lead to behavioral disengagement (Categories 7-8) [46, 50, 57]. Opportunities provide external conditions for the implementation of behaviors. Patients who can obtain sufficient family support, convenient digital health tools and regular professional guidance show significantly better adherence to volume-management regimens (Category 9-13) [38, 39, 46].

Beyond direct effects, capability and opportunity exert indirect influences on HBVM behaviors through their effects on motivation. This mediating pathway is a critical mechanism that explains why interventions targeting capability or opportunity alone often yield suboptimal outcomes if they fail to address motivational processes. Enhanced disease knowledge and practical management skills improved patients' perceived control over their condition, thereby strengthening self-efficacy and reflective motivation.

The COM-B model emphasizes that the relationship among capability, opportunity, and motivation is reciprocal and dynamic [23]. Repeated performance of HBVM behaviors can improve patients' practical skills and self-management capabilities through experiential learning, forming a positive feedback loop [48]. By contrast, abandoning relevant behaviors will lead to skill atrophy and declining capabilities over time.

Additionally, this meta-synthesis uncovered a novel interactive pathway among the influencing factors: opportunity can improve individual capability to form a reinforcing "opportunity–capability–behavior" chain. Sufficient access to medical services, readily available health information and social support including family assistance not only directly facilitate the implementation of volume management, but also enhance patients' self-management capability through skill training, experience sharing and situational learning [38, 41, 47]. This enhancing pathway is particularly important for older CHF patients, who often experience age-related cognitive decline, multimorbidity, and functional limitations [55]. Strengthening the external support system, including family engagement, community health services, and digital health tools, can compensate for individual capability limitations and facilitate effective HBVM.

4.2. Comparison with Existing Literature and Theoretical Contributions

The findings of our study both validate and expand the existing evidence base for factors related to home-based volume management (HBVM) in patients with chronic heart failure (CHF).

First, although previous meta-synthesis studies have systematically sorted out various barriers and facilitators, most of these studies treat these factors as mutually independent variables and fail to interpret their dynamic interactions [21, 58, 59]. Herber et al. [59] proposed that self-care behavior is the outcome of natural decision-making processes shaped by self-efficacy and patients' illness perceptions. Nevertheless, this context-specific theory does not explicitly explain how external environmental factors interact with individual cognitive and motivational processes. Conducting an integrated analysis based on the COM-B model, this study maps each influencing factor to six theoretical dimensions and clarifies the direct, mediating and interaction effects among these factors. This theory-driven analytical framework not only assembles fragmented evidence from 18 primary studies into a coherent system, but also reveals that the effect of a single factor on home-based volume management behavior is simultaneously modulated by its interactions with other factors. This offers a more nuanced explanation for why single-component interventions often fail to achieve desirable outcomes.

Second, this study identifies a novel reinforcement path of "opportunity-ability-behavior". A recent meta-synthesis study categorized complex physiological conditions, negative emotions and psychological states, and diverse sociocultural factors into three types of barriers to volume management, yet failed to elaborate on the dynamic mechanism among these factors [21].Our study indicate that opportunity can not only directly promote HBVM but also improve patients' self-management abilities. This path echoes the cumulative complexity model proposed by Shippee et al. [60], which posits that patients' self-care ability is determined by the degree of match between treatment burden and accessible resources.

Third, the studies included in the analysis varied in the degree of attention paid to the six dimensions of the COM-B model, and this finding can provide references for future research directions (Table 2). Among 18 studies, the automatic motivation dimension covering habit- and emotion-driven factors was explored in only 14 (77.8%) studies. The above distribution characteristics suggest that existing qualitative studies may underestimate the influences of habits and emotions on HBVM. Meanwhile, theoretical and empirical evidence from other chronic-disease fields has indicated that automatic psychological processes are critical for sustaining long-term behavioral adherence [60, 61].

4.3 Implications of Meta-analysis Results for Clinical Nursing Interventions

Based on the three-dimensional interactive mechanism of the COM-B model un-covered in the present study, interventions targeting home-based volume management among CHF patients should integrate capability construction, environmental optimization and motivation stimulation, so as to establish a multi-dimensional and individualized comprehensive intervention system.

In terms of capability empowerment, repetitive, visualized and simplified skill training shall be implemented. Popular educational materials such as graphic manuals and short videos can be developed to help patients efficiently acquire health knowledge during their spare time [62, 63]. Herrmann et al. [64] suggested that thirst, as a subjective physical symptom occurring during patients' volume management, should be incorporated into the whole-process assessment framework for heart failure management, together with quality of life and symptom burden as co-evaluated indicators. Targeted interventions to relieve patients' thirst discomfort could effectively prevent treatment resistance and behavioral discontinuation [65].

With regard to opportunity optimization, the reinforcing "opportunity-capability" pathway should be fully exploited. Individualized adaptive management protocols can be formulated for patients by optimizing living environments, mobilizing multi-layered support resources and providing social communication opportunities, which compensates for patients' insufficient self-management capabilities.

From the perspective of motivation activation, both rational and emotional motivation cultivation should be equally emphasized. Patient self-efficacy can be strengthened and disease-related negative emotions alleviated through real-time symptom feedback and sharing of successful self-management cases. Meanwhile, patients should be guided to gradually eliminate unhealthy lifestyle habits, integrate daily volume monitoring and restriction behaviors into routine life, and ultimately realize the behavioral transformation from passive disease management to active self-regulated care.

The optimal HBVM intervention program is likely one that covers all three dimensions of the COM-B model simultaneously and leverages the synergistic effects across these dimensions. For instance, home-based interventions (opportunity dimension) can improve patients' practical skills through shared learning (capability dimension), while strengthening patients' motivation via emotional support and positive reinforcement (motivation dimension). Digital health tools (opportunity dimension) can enhance patients' capability through educational content and reminder functions, and stimulate patients' motivation with real-time feedback and progress visualization.

4.4 Limitations

This meta-synthesis has several limitations that should be acknowledged when interpreting the findings. First, the included qualitative studies were predominantly conducted within specific cultural backgrounds and healthcare systems, particularly in China and the United States, may limit the cross-cultural generalizability of our findings to other populations and healthcare settings. Second, whilst this meta-synthesis identified associations among influencing factors, the qualitative nature of the included studies does not permit causal inferences or the quantification of the relative weights of each factor. Third, the analysis relied on published qualitative data and may not fully capture the depth and nuance of participants' lived experiences beyond what was reported in the original studies. Fourth, the quality assessment revealed that some included studies didn't report researcher reflexivity (Items 6), a common limitation in qualitative research that may affect the trustworthiness of the primary studies' findings.

Despite these limitations, the meta-aggregation approach employed in this study allowed for the systematic integration of findings across diverse contexts, providing a comprehensive understanding of the factors influencing home-based volume management in CHF patients. Future research should consider including studies from underrepresented regions and languages, as well as employing longitudinal qualitative designs to capture the dynamic nature of volume management behaviors over time. Additionally, quantitative studies are warranted to verify the causal pathways and relative weights of the factors identified in this synthesis.

Conclusions

This study adopted the COM-B model as the theoretical framework and con-ducted a meta-synthesis of 18 qualitative studies concerning home-based volume management among CHF patients. Six integrated themes covering capability, motiva-tion and opportunity were summarized. This research systematically revealed the in-ternal mechanism through which the three dimensions dynamically interact to shape patients' volume management behaviors, and for the first time illustrated the positive reinforcing pathway of "opportunity–capability–behavior". Our findings indicate that interventions targeting HBVM should adopt a multi-dimensional approach that simultaneously addresses capability deficits, optimizes environmental opportunities, and activates both reflective and automatic motivational processes.

Abbreviations

BCW	Behavior Change Wheel
BOT	Burden of Treatment
CASP	Critical Appraisal Skills Programme
CCM	Cumulative Complexity Model
CFIR	Consolidated Framework for Implementation Research
CHF	Chronic Heart Failure
COM-B	Capability, Opportunity, Motivation-Behavior
ENTREQ	Enhancing Transparency in Reporting the Synthesis of Qualitative Research
HBVM	Home-based Volume Management
HF	Heart Failure
JBI	Joanna Briggs Institute
MeSH	Medical Subject Headings
NYHA	New York Heart Association
PICoS	Population, Interest of phenomena, Context, Study design
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SPIDER	Sample, Phenomenon of Interest, Design, Evaluation, Research type
TDF	Theoretical Domains Framework
TCM	Traditional Chinese Medicine

Declarations

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References

1. Biegus, J. et al. Contemporary heart failure evidence in 2025: a joint summary of key trials from the European Journal of Heart Failure and ESC Heart Failure Journal. *Eur. J. Heart Fail. Published online January*. **17** 10.1093/ejhf/xuag015 (2026).
2. Johnson, C. & Roth, G. A. Global aetiologies of heart failure: results from the Global Burden of Disease Study 2023, European Heart Journal, Volume 46, Issue Supplement_1, November 2025, ehaf784.1065, https://doi.org/10.1093/eurheartj/ehaf784.1065
3. Lan, T. et al. Mortality and Readmission Rates After Heart Failure: A Systematic Review and Meta-Analysis. *Ther. Clin. Risk Manag*. **17**, 1307–1320 (2021). PMID: 34908840; PMCID: PMC8665875.
4. Ganapathy, A. et al. Advances in Congestion Assessment in Decompensated Heart Failure. *Card Fail. Rev.* **12**, e02. 10.15420/cfr.2025.52 (2026). Published 2026 Feb 16.
5. Marco, M. et al. Worsening of chronic heart failure: definition, epidemiology, management and prevention. A clinical consensus statement by the Heart Failure Association of the European Society of Cardiology.[J].European journal of heart failure,2023,25(6):10.1002/EJHF.2874
6. Biegus, J., Borlaug, B. A. & Testani, J. M. Congestion and decongestion assessment in heart failure: pressure, volume, or both? *JACC Heart Fail.* **11**, 1152–1156. https://doi.org/10.1016/j.jchf.2023.05.034 (2023).
7. Chinese College of Cardiovascular Physicians, Chinese Heart Failure Association of Chinese Medical Doctor Association. Editorial Board of the Chinese Journal of Heart Failure and Cardiomyopathy. Chinese expert recommendations on volume management in heart failure. *Chin. J. Heart Fail. Cardiomyopathy*. **2**, 8–16. https://doi.org/10.3760/cma.j.issn.2096-3076.2018.03.004 (2018).
8. Foroutan, F. et al. Global comparison of readmission rates for patients with heart failure. *J. Am. Coll. Cardiol.* **82**, 430–444. https://doi.org/10.1016/j.jacc.2023.05.040 (2023).
9. Karimi, A., Mathew, K. & Pourafshar, N. Mechanisms of congestion in acute decompensated heart failure. *Cardiorenal Med.* **15**, 544–551. https://doi.org/10.1159/000544929 (2025).
10. Chinese Society of Cardiology, Chinese College of Cardiovascular Physicians, Chinese Heart Failure Association of Chinese Medical Doctor Association. Chinese guidelines for the diagnosis and treatment of heart failure 2024. *Chin. J. Cardiol.* **52**, 235–275. https://doi.org/10.3760/cma.j.cn112148-20231101-00405 (2024).
11. Heidenreich, P. A. et al. 2022 AHA/ACC/HFSA guideline for the management of heart failure. *J. Card Fail.* **28**, e1–e167. https://doi.org/10.1016/j.cardfail.2022.02.010 (2022).
12. Himeno, Y. et al. Post-Discharge Self-Care Confidence and Performance Levels in Patients Hospitalized due to Heart Failure. *J. Card. Fail.*, **31**(8), 1103–1114. https://doi.org/10.1016/j.cardfail.2024.10.441
13. Mullens, W. et al. Dietary sodium and fluid intake in heart failure. A clinical consensus statement of the Heart Failure Association of the ESC.[J].European journal of heart failure,2024,26(4):730–741. 10.1002/EJHF.3244
14. Zhu, H. X. et al. Current status and influencing factors of self-care task performance ability in elderly patients with chronic heart failure. *J. Nurs. Sci.* **40**, 11–15. https://doi.org/10.3870/j.issn.1001-4152.2025.19.011 (2025).
15. van Kimmenade, R. R. J. et al. Liberal fluid intake versus fluid restriction in chronic heart failure: results of the FRESH–UP study. *Nat. Med.* https://doi.org/10.1038/s41591-025-03606-2 (2025).
16. El-Zein, R. S. et al. Association of medication adherence and health status in heart failure with reduced ejection fraction: insights from the CHAMP-HF registry. *Circ. Cardiovasc. Qual. Outcomes*. **17**, e010211. https://doi.org/10.1161/CIRCOUTCOMES.123.010211 (2024).
17. Gunnthorsdottir, I. et al. Exploring Medication Adherence in Heart Failure From a Patient Perspective: A Qualitative Study. *Circ. Heart. Fail.* **19** (5), e014133. https://doi.org/10.1161/CIRCHEARTFAILURE.125.014133 (2026).
18. Caples, N., O'Brien, F. & Mooney, M. App versus logbook for weight monitoring and help–seeking behavior in heart failure: a single–group quasi–experimental study. *J. Cardiovasc. Nurs.* https://doi.org/10.1097/JCN.0000000000001316 (2026).
19. Jiao, M. et al. A scoping review of home–based volume management in patients with heart failure. *Chin. J. Mod. Nurs.* **31**, 2792–2800. https://doi.org/10.3760/cma.j.cn115682-20250225-00870 (2025).
20. Nourse, R., Kayser, L. & Maddison, R. Developing requirements for a digital self-care intervention for adults with heart failure: qualitative workshop study. *J. Med. Internet Res.* **27**, e72589. https://doi.org/10.2196/72589 (2025).
21. Zhang, Y. et al. Y. Barriers to self volume management in patients with heart failure: a meta synthesis. *Chin. Nurs. Manag*. **25**, 1529–1534. https://doi.org/10.3969/j.issn.1672-1756.2025.10.018 (2025).
22. Susan, M. & M M S V, Robert, W. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. [J]. *Implement. Sci. : IS*. **6** (1), 42. 10.1186/1748-5908-6-42 (2011).
23. West, R. & Michie, S. A brief introduction to the COM-B Model of behaviour and the PRIME Theory of motivation. Qeios (2020). https://doi.org/10.32388/WW04E6

24. Duan, L. et al. Barriers to shared decision-making for cancer patients based on COM-B: systematic review. *BMC Med. Inf. Decis. Mak.* **25**, 369. https://doi.org/10.1186/s12911-025-03194-2 (2025).
25. Malkowski, O. S. et al. Enablers and barriers to physical activity among older adults of low socio-economic status: a systematic review of qualitative literature guided by the COM-B model. *Int. J. Behav. Nutr. Phys. Act.* **22**, 82. https://doi.org/10.1186/s12966-025-01753-4 (2025).
26. Kiselev, N. et al. Factors influencing engagement in a digital substance use prevention program: qualitative study using the capability, opportunity, motivation model and theoretical domains framework. *JMIR Mhealth Uhealth*. **13**, e64861. https://doi.org/10.2196/64861 (2025).
27. Lu, J., Wang, J., You, Z., Wang, Q. & Sun, G. A study on the influencing factors of exercise adherence in patients with chronic heart failure: from a configuration perspective. *Front. Psychol.* **15**, 1536349. https://doi.org/10.3389/fpsyg.2025.1536349 (2025).
28. Barker, H. et al. Applying the COM-B behaviour model to overcome barriers to heart failure self-care: a practical application (ACHIEVE study). *Eur. J. Cardiovasc. Nurs.* **20**, 261–269. https://doi.org/10.1177/1474515120957292 (2021).
29. Zou, H. J. et al. Identification of factors associated with self-care behaviors using the COM-B model in patients with chronic heart failure. *Eur. J. Cardiovasc. Nurs.* **16**, 380–388. https://doi.org/10.1177/1474515117699994 (2017).
30. Yu, W. H., Zhu, H. H., Chen, Q. J., Zhu, D. & Chen, Y. A qualitative study on home management behavior experience of volume overload in elderly patients with chronic heart failure based on the COM–B theory. *Pract. Geriatr.* **38**, 625–628. https://doi.org/10.3969/j.issn.1003-9198.2024.06.019 (2024).
31. Thomas, J. & Harden, A. Methods for the thematic synthesis of qualitative research in systematic reviews[J]. *BMC Med. Res. Methodol.* **8**, 45 (2008).
32. Page, M. J. et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* **372**, n71. 10.1136/bmj.n71 (2021).
33. Tong, A., Flemming, K., McInnes, E., Oliver, S. & Craig, J. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med. Res. Methodol.* **12**, 181. 10.1186/1471-2288-12-181 (2012).
34. Cooke, A., Smith, D., Booth, A. & Beyond, P. I. C. O. the SPIDER tool for qualitative evidence synthesis[J]. *Qual. Health Res.* **22** (10), 1435–1443 (2012).
35. Haddaway, N. R., Page, M. J., Pritchard, C. C. & McGuinness, L. A. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Syst. Reviews*. **18**, e1230. https://doi.org/10.1002/cl2.1230 (2022).
36. Critical Appraisal Skills Programme. CASP Qualitative Studies Checklist[EB/OL]. [2026-08-18]. https://casp-uk.net/casp-tools-checklists/
37. Lewin, S. et al. Applying GRADE-CERQual to qualitative evidence synthesis findings: introduction to the series[J]. *Implement. Sci.* **13** (Suppl 1), 2 (2018).
38. Xu, X. et al. Facilitators and barriers to self–volume management in older patients with chronic heart failure and multimorbidity: a qualitative study. *Healthcare* **13**, 2353. https://doi.org/10.3390/healthcare13182353 (2025).
39. Sevilla–Cazes, J. et al. Heart failure home management challenges and reasons for readmission: a qualitative study to understand the patient's perspective. *J. Gen. Intern. Med.* **33**, 1700–1707. https://doi.org/10.1007/s11606-018-4542-3 (2018).
40. Nordfonn, O. K., Morken, I. M. & Husebø, A. M. L. A qualitative study of living with the burden from heart failure treatment: exploring the patient capacity for self–care. *Nurs. Open.* **7**, 804–813. https://doi.org/10.1002/nop2.455 (2020).
41. Zhang, Y. Y. Effect of two–year weight management on the prognosis in patients with chronic congestive heart failure. Master's thesis, Soochow University (2016). https://doi.org/10.7666/d.D01006927
42. Li, T. et al. Study on the attitude and behavior personas of volume management in elderly patients with chronic heart failure. *J. Nurses Train.* **41**, 1259–1265. https://doi.org/10.16821/j.cnki.hsjx.2026.12.005 (2026).
43. Yu, M. et al. Study of the volume management journey map in patients with chronic heart failure. *J. Nurs. Sci.* **40**, 20–24. https://doi.org/10.3870/j.issn.1001-4152.2025.07.020 (2025).
44. Lu, H. H. et al. Influencing factors of home fluid intake management in patients with chronic heart failure: a qualitative study. *J. Nurs. Sci.* **40**, 94–98. https://doi.org/10.3870/j.issn.1001-4152.2025.05.094 (2025).
45. Qiao, Y. et al. Experience of volume management in home–dwelling elderly patients with chronic heart failure: a qualitative study. *J. Nurs. Sci.* **38**, 108–111. https://doi.org/10.3870/j.issn.1001-4152.2023.04.108 (2023).
46. Meraz, R., Osteen, K., McGee, J. S., Noblitt, P. & Viejo, H. Applying stress and coping theory to understand diuretic adherence experiences in persons with heart failure. *West. J. Nurs. Res.* **45**, 1–11. https://doi.org/10.1177/01939459221106122 (2022).
47. He, T., Zhang, G. H., Fang, Y. C., Yang, X. Y. & Deng, Y. Predictors of weight management behavior in patients with chronic heart failure: a qualitative study. *Chin. Gen. Pract. Nurs.* **17**, 1885–1887. https://doi.org/10.12104/j.issn.1674-4748.2019.15.038 (2019).

48. Rong, X., Peng, Y., Yu, H. & Li, D. Cultural factors influencing dietary and fluid restriction behaviour: perceptions of older Chinese patients with heart failure. *J. Clin. Nurs.* **26**, 717–726. https://doi.org/10.1111/jocn.13515 (2017).
49. Sheahan, S. L. & Fields, B. Sodium dietary restriction, knowledge, beliefs, and decision–making behavior of older females. *J. Am. Acad. Nurse Pract.* **20**, 217–224. https://doi.org/10.1111/j.1745-7599.2008.00307.x (2008).
50. Ju, Y. et al. Qualitative research on the factors affecting long–term compliance to weight management of patients with congestive heart failure. *Chin. J. Mod. Nurs.* **29**, 52–55. https://doi.org/10.3760/cma.j.issn.1672-7088.2013.35.019 (2014).
51. Tang, R. X. et al. Qualitative study on behavioral determinants in capacity management of chronic heart failure patients. *Chin. Nurs. Res.* **39**, 3468–3473. https://doi.org/10.12102/j.issn.1009-6493.2025.20.014 (2025).
52. Ma, H. et al. Thirst symptom experience in patients with chronic heart failure: a qualitative study. *Chin. Gen. Pract. Nurs.* **21**, 546–549. https://doi.org/10.12104/j.issn.1674-4748.2023.04.028 (2023).
53. Heo, S. et al. Experiences of and factors associated with dietary sodium adherence in heart failure from patients' and their caregivers' perspectives: a qualitative study. *Geriatr. Nurs.* **42**, 1190–1197. https://doi.org/10.1016/j.gerinurse.2021.07.001 (2021).
54. Wang, A. et al. Real–life experiences of self–capacity management in patients with chronic heart failure: a qualitative study. *Patient Prefer Adherence*. **19**, 1747–1760. https://doi.org/10.2147/PPA.S519773 (2025).
55. Gerhardt, T. et al. Multimorbidity in patients with acute heart failure across world regions and country income levels (REPORT-HF): a prospective, multicentre, global cohort study. *Lancet Glob Health*. **11** (12), e1874–e1884. 10.1016/S2214-109X(23)00408-4 (2023).
56. General Practice Branch of the Cross-Strait Medical and Health Exchange Association, General Practice Branch of Zhejiang Medical Association, Public Health Branch of Chinese Geriatrics Society, et al. Expert consensus on the diagnosis, treatment and management of xerostomia (2025). Chin Gen Pract Clin Educ et al. ;23(9):772–790. (2025). 10.13558/j.cnki.issn1672-3686.2025.009.002
57. Sonoda, K. & Khoo, P. C. Psychological interventions for depression and anxiety in patients with coronary heart disease or heart failure. *Am. Fam Physician*. **110** (6), 575–576 (2024). PMID: 39700359.
58. Herber, O., Rudolf, Buecker, Bettina, Metzendorf, M. I. & Barroso, J. A qualitative meta-summary using Sandelowski and Barroso's method for integrating qualitative research to explore barriers and facilitators to self-care in heart failure patients. *Eur. J. Cardiovasc. nursing: J. Working Group. Cardiovasc. Nurs. Eur. Soc. Cardiol.* **16** (8), 662–677. http://dx.chinadoi.cn/10.1177/1474515117711007 (2017).
59. Herber, O. R., Kastaun, S., Wilm, S. & Barroso, J. From Qualitative Meta-Summary to Qualitative Meta-Synthesis: Introducing a New Situation-Specific Theory of Barriers and Facilitators for Self-Care in Patients With Heart Failure. *Qual. Health Res.* **29** (1), 96–106. 10.1177/1049732318800290 (2019).
60. Shippee, D. N. et al. Cumulative complexity: a functional, patient-centered model of patient complexity can improve research and practice[J]. *J. Clin. Epidemiol. 2012*, **65**(10):1041–1051. 10.1016/j.jclinepi.2012.05.005
61. Gardner, B., Lally, P. & Wardle, J. Making health habitual: the psychology of 'habit-formation' and general practice[J]. *Br. J. Gen. Pract.* **62** (605), 664–666. 10.3399/bjgp12X659466 (2012).
62. Oh, E. G., Lee, J. Y., Lee, H. J. & Oh, S. Effects of discharge education using teach-back methods in patients with heart failure: a randomized controlled trial. *Int. J. Nurs. Stud.* **140**, 104453. 10.1016/j.ijnurstu.2023.104453 (2023).
63. Deshpande, N. et al. Video-based educational interventions for patients with chronic illnesses: systematic review. *J. Med. Internet Res.* **25**, e41092. 10.2196/41092 (2023).
64. Herrmann, J. J. et al. Fluid restriction in heart failure vs liberal fluid uptake: rationale and design of the randomized FRESH-UP study. *J. Card Fail.* **28** (10), 1522–1530. 10.1016/j.cardfail.2022.05.015 (2022).
65. Cao, Q. Y. et al. Construction and application of a thirst symptom management program for patients with chronic heart failure. *Chin. Nurs. Manag*. **25** (4), 512–517. 10.3969/j.issn.1672-1756.2025.04.006 (2025). http://dx.chinadoi.cn/

Figures

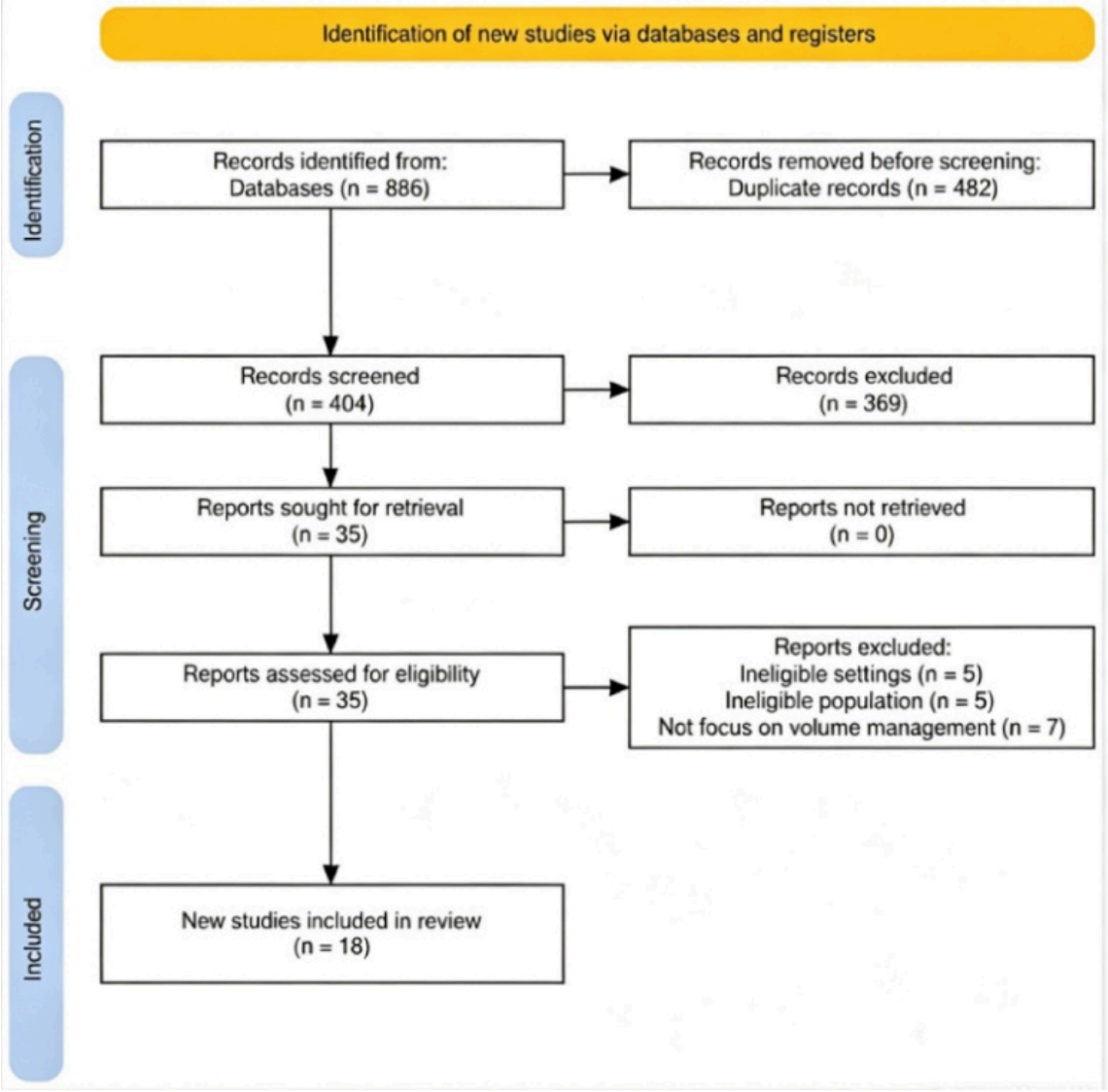


Figure 1

Study selection process (PRISMA flow diagram).

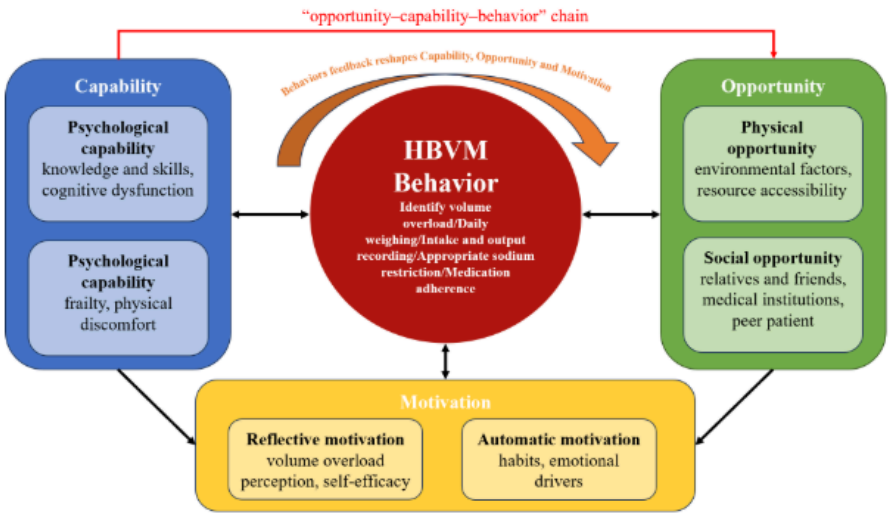


Figure 2

The Dynamic Interaction Mechanism of Capability, Opportunity and Motivation

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