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Umbrella review and evidence mapping of systematic reviews on traditional Chinese medicine for frailty and sarcopenia in older adults

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ADMINISTRATIVE INFORMATION**Support** - National Key R&D Program of China (2020YFC2003100, 2020YFC2003102).**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202690099**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 23 September 2026 and was last updated on 23 September 2026.**INTRODUCTION**

Review question / Objective Primary objective: To systematically identify, appraise, and synthesise existing systematic reviews (SRs) and meta-analyses evaluating the efficacy and safety of traditional Chinese medicine (TCM) interventions for frailty and sarcopenia in older adults, and to map the current evidence landscape.

Secondary objectives:

- 1.To evaluate the methodological quality of included SRs using AMSTAR 2.
- 2.To assess the reporting quality of included SRs using PRIOR (Preferred Reporting Items for Overviews of Reviews).
- 3.To grade the certainty of evidence using GRADE.
- 4.To calculate the overlap of primary studies across SRs using the Corrected Covered Area (CCA).
- 5.To visually map the evidence using four-dimensional bubble plots (effect direction ×

methodological quality × sample size × intervention type).

PICO(S) framework:

P (Population): Older adults (≥60 years) diagnosed with frailty and/or sarcopenia.

I (Intervention): TCM comprehensive interventions, including Chinese herbal medicine (oral decoctions, patent medicines, capsules), traditional mind-body exercises (Tai Chi, Baduanjin, Qigong, Wuqinxi, Yijinjing), acupuncture (manual acupuncture, electroacupuncture, auricular acupressure), and Tuina/manual therapy, either alone or in combination with conventional treatment.

C (Comparator): Conventional treatment, placebo, sham acupuncture, waitlist, or no treatment.

O (Outcomes): Frailty improvement, muscle strength, muscle mass, physical function, adverse events.

S (Study design): Systematic reviews and meta-analyses of randomised controlled trials (RCTs).

Rationale Frailty and sarcopenia are prevalent geriatric syndromes associated with increased risk of falls, disability, hospitalisation, and mortality. By 2050, the global population aged 65 and older is projected to reach 16%. Traditional Chinese medicine (TCM)—encompassing herbal medicine, mind-body exercises (Tai Chi, Baduanjin, Qigong), and acupuncture—has been increasingly investigated for these conditions, with a rapidly growing number of systematic reviews published. However, the methodological quality, reporting completeness, and evidence certainty of these SRs remain unclear, and no umbrella review has yet been conducted to synthesise this body of evidence. Sarcopenia is recognised as the core somatic manifestation of frailty (EWGSOP2 consensus, 2019), and the two conditions are highly comorbid. This umbrella review will comprehensively appraise all available SRs/Meta-analyses on TCM for frailty and sarcopenia, providing an evidence map to guide clinical decision-making and identify research gaps. Frailty and sarcopenia are prevalent geriatric syndromes associated with increased risk of falls, disability, hospitalisation, and mortality. Traditional Chinese medicine (TCM)—encompassing herbal medicine, mind-body exercises (Tai Chi, Baduanjin, Qigong), and acupuncture—has been increasingly investigated for these conditions, with a growing number of systematic reviews published. However, the methodological quality, reporting completeness, and evidence certainty of these SRs remain unclear. Sarcopenia is recognised as the core somatic manifestation of frailty (EWGSOP2 consensus, 2019), and the two conditions are highly comorbid. This umbrella review will synthesise and critically appraise all available SRs/Meta-analyses on TCM for frailty and sarcopenia, providing a comprehensive evidence map to guide clinical decision-making and identify research gaps.

Condition being studied Frailty is a clinical state of increased vulnerability resulting from age-associated decline in reserve and function across multiple physiological systems, leading to diminished ability to cope with everyday or acute stressors. It is commonly assessed using validated instruments such as the Fried Frailty Phenotype, FRAIL scale, or Edmonton Frailty Scale. Sarcopenia is a progressive and generalised skeletal muscle disorder involving the accelerated loss of muscle mass, strength, and function, formally coded in ICD-10 (M62.84) and defined by the European Working Group on Sarcopenia in Older People (EWGSOP2, 2019) and the Asian Working Group for Sarcopenia (AWGS 2019). Sarcopenia is recognised as the core somatic

manifestation of frailty, and the two conditions share overlapping pathophysiological mechanisms and are highly comorbid in older adults. Frailty is a clinical state of increased vulnerability resulting from age-associated decline in reserve and function across multiple physiological systems, leading to diminished ability to cope with everyday or acute stressors. It is commonly assessed using validated instruments such as the Fried Frailty Phenotype, FRAIL scale, or Edmonton Frailty Scale. Sarcopenia is a progressive and generalised skeletal muscle disorder involving the accelerated loss of muscle mass, strength, and function, formally coded in ICD-10 (M62.84) and defined by the European Working Group on Sarcopenia in Older People (EWGSOP2, 2019) and the Asian Working Group for Sarcopenia (AWGS 2019). The two conditions are highly comorbid and share overlapping pathophysiological mechanisms.

METHODS

Search strategy A three-block search strategy will be applied across eight electronic databases: (1) Condition block: frailty, frail, sarcopenia, 衰弱, 肌少症; (2) Intervention block: Traditional Chinese Medicine, Chinese herbal medicine, acupuncture, Tai Chi, Baduanjin, Qigong, Kampo, decoction, 中医, 中药, 针灸, 太极拳, 八段锦, 气功; (3) Study type block: systematic review, meta-analysis, 系统评价, 荟萃分析. The full search strings for each database are provided in the supplementary file.

Participant or population Older adults (aged ≥ 60 years) diagnosed with frailty (using validated frailty instruments such as Fried Phenotype, FRAIL scale, Edmonton Frailty Scale, or other recognised criteria) and/or sarcopenia (using AWGS, EWGSOP2, or other recognised diagnostic criteria).

Intervention TCM comprehensive interventions, including:

Chinese herbal medicine (oral): decoctions, patent medicines, capsules, tablets
Traditional mind-body exercises: Tai Chi, Baduanjin, Qigong, Wuqinxi, Yijinjing
Acupuncture: manual acupuncture, electroacupuncture, auricular acupressure
Tuina/manual therapy: Tuina, acupressure, acupoint application
Interventions may be administered alone or in combination with conventional treatment. For combination therapy (A+B vs B), the conventional treatment component must be identical between intervention and control groups.

Comparator Conventional treatment, placebo, sham acupuncture, waitlist control, or no treatment.

Study designs to be included Systematic reviews and meta-analyses of randomised controlled trials (RCTs). Both narrative systematic reviews and meta-analyses will be included. Umbrella reviews, scoping reviews, and narrative reviews will be excluded.

Eligibility criteria Inclusion:

Systematic reviews and/or meta-analyses of RCTs
Published in English or Chinese
Population: older adults (≥ 60 years) with frailty and/or sarcopenia
Intervention: any TCM modality as defined above
Comparator: any control group as defined above
Reports at least one outcome related to frailty, muscle strength, muscle mass, physical function, or adverse events
Exclusion:

Non-RCT-based systematic reviews
Interventions with no TCM component
Asymmetric combination therapy (A+B vs C, where conventional treatments differ between groups)
Duplicate publications (retain the most complete/updated version)
Conference abstracts, protocols, letters, editorials
Data insufficient for extraction.

Information sources Electronic databases (8):

PubMed
Embase
Cochrane Library (CDSR only – CENTRAL excluded as it indexes primary trials, not systematic reviews)
Web of Science Core Collection
CNKI (China National Knowledge Infrastructure)
WanFang Data
VIP (CQVIP)
SinoMed (CBM)
Other sources:

Reference lists of included SRs will be hand-searched
No grey literature searches (consistent with the aim of indexing published SRs/Meta-analyses)
Search dates: From database inception to September 2026.

Main outcome(s) Primary outcomes:

1. Frailty status improvement (e.g., change in frailty score, reversion from frail/prefrail to robust)

2. Muscle strength (e.g., handgrip strength, chair stand test)
3. Physical function (e.g., gait speed, Timed Up and Go test, SPPB).

Additional outcome(s) 4. Muscle mass: appendicular skeletal muscle mass (ASM), skeletal muscle mass index (SMI) measured by DXA or BIA.
5. Adverse events: any reported adverse events during intervention.
6. Quality of life: measured by validated instruments (e.g., EQ-5D, SF-36). Secondary outcomes: 4. Muscle mass (e.g., appendicular skeletal muscle mass, DXA/BIA) 5. Adverse events 6. Quality of life.

Data management All retrieved records will be imported into EndNote 20 for deduplication and management. Two independent reviewers (Z.W. and J.L.) will conduct title/abstract screening and full-text screening independently using a standardised form piloted on the first 10 records. Screening results will be cross-checked; discrepancies will be resolved by discussion or consultation with a third reviewer (C.N.). A PRISMA-compliant flow diagram will be used to document the screening process. Extracted data will be stored in a secured Excel spreadsheet with version control. All quality assessment tools (AMSTAR 2, PRIOR, GRADE) will be pilot-tested on two included SRs before formal assessment to ensure inter-rater consistency. The CCA overlap matrix and evidence mapping visualisations will be generated using R (version 4.3.2 or later) and Pymeta (<https://www.pymeta.com/evdmap/>).

Population: sample size, mean age, diagnostic criteria, setting
Intervention: TCM modality (herbal/exercise/acupuncture/manual/combined), dosage, duration
Comparator: type
Outcomes: all reported outcomes with effect sizes and 95% CIs
Number and list of primary RCTs included in each SR (for CCA calculation)
SR authors' risk of bias assessment of primary RCTs (tool used, summary of results) All retrieved records will be imported into EndNote 20 for deduplication and management. Two independent reviewers (Z.W. and J.L.) will conduct title/abstract screening and full-text screening independently using a standardised form piloted on the first 10 records. Screening results will be cross-checked; discrepancies resolved by discussion or third reviewer (C.N.). A PRISMA-compliant flow diagram will document the screening process. Extracted data stored in a secured Excel spreadsheet with version control. All quality assessment tools (AMSTAR 2, PRIOR, GRADE) pilot-tested on two

SRs before formal assessment. CCA overlap matrix and evidence mapping generated using R (4.3.2+) and Pymeta.

Quality assessment / Risk of bias analysis

Three-level quality assessment:

1.AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews 2) — 16 items, with critical items 2, 4, 7, 9, 11, 13, 15. Each SR will receive an overall confidence rating: high / moderate / low / critically low.

2.PRIOR (Preferred Reporting Items for Overviews of Reviews) — the international reporting standard specific to umbrella reviews, assessing completeness of reporting in each SR.

Original RCT risk of bias extraction — the review team will extract each included SR's own assessment of its primary RCTs (e.g., Cochrane RoB 1.0/2.0), including the tool used, overall ratings (high/low/unclear risk), and proportion of high-risk RCTs. This information will be used to inform GRADE downgrading for risk of bias.PRIOR (Preferred Reporting Items for Overviews of Reviews) — the international reporting standard specific to umbrella reviews, replacing PRISMA 2020 which targets primary systematic reviews.

3.AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews 2) — 16 items, with critical items 2, 4, 7, 9, 11, 13, 15. Overall confidence rating: high / moderate / low / critically low.

Strategy of data synthesis 1.Descriptive synthesis: structured tables summarising characteristics of included SRs (population, intervention, comparator, outcomes, number of primary studies).

2.AMSTAR 2: overall confidence rating per SR; results presented in a summary table.

3.PRIOR: compliance assessment per SR; results presented in a summary table.

4.CCA (Corrected Covered Area): primary RCT lists extracted from each SR; RCT × SR cross-matrix constructed; CCA calculated per outcome. Interpretation: 15% very high. Hard threshold: CCA >15% for the same outcome → only the SR with the highest AMSTAR 2 rating or largest RCT count retained for quantitative synthesis; others described qualitatively.

5.GRADE: certainty assessed per outcome per comparison (5 downgrade factors: risk of bias, inconsistency, indirectness, imprecision, publication bias; 3 upgrade factors: large effect, dose-response, plausible confounding).

6.Evidence mapping: four-dimensional bubble plot using Pymeta (<https://www.pymeta.com/evdmap/>). X-axis: effect direction (beneficial/harmful/no

effect); Y-axis: AMSTAR 2 rating (high/moderate/low/critically low); bubble size: number of primary studies; colour: intervention type (herbal/exercise/acupuncture/manual/combined).

Subgroup analysis 1.By intervention type: TCM-herbal vs TCM-exercise vs TCM-acupuncture vs TCM-manual vs TCM-combined

2.By condition: Frailty-only vs Sarcopenia-only vs Both

3.By methodological quality: SRs rated high/moderate vs low/critically low on AMSTAR 2.

Sensitivity analysis 1.Excluding SRs with CCA >15% overlap (retain only highest-quality SR per outcome)

2.Excluding SRs published before 2020 (to assess the impact of including older, potentially outdated evidence).

Language restriction English and Chinese.

Country(ies) involved China.

Other relevant information This umbrella review is part of the first author's (Zheng Wang) doctoral dissertation research at Beijing University of Chinese Medicine, supervised by Prof. Cheng Ni. The doctoral project investigates the relationship between TCM constitution types and physiological function in older adults (24,812 participants, 7 regions, 14 provinces, 2020–2023), funded by the National Key R&D Program of China (2020YFC2003100, 2020YFC2003102). Frailty assessment (FRAIL scale), latent profile analysis of functional impairment, and structural equation modelling of functional decline are integral components of the dissertation. This umbrella review complements the dissertation by synthesising external evidence on TCM interventions for frailty and sarcopenia, thereby bridging the dissertation's observational findings with interventional evidence from the broader literature.

Keywords Frailty, Sarcopenia, Traditional Chinese Medicine, Acupuncture, Tai Chi, Umbrella review, Evidence mapping, Systematic review.

Dissemination plans Publication in a peer-reviewed SCI journal and presentation at international conferences on geriatrics and integrative medicine.

Contributions of each author

Author 1 - Zheng Wang - Conceived the study, designed the search strategy, drafted the protocol,

will conduct literature screening, data extraction, and quality assessment, and wrote the manuscript.

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