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Community-Based Health-Social Partnership Programme (C-HSPP) for enhancing self-care management among older adults: protocol for a hybrid effectiveness-implementation trial

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Abstract

Background The global ageing population imposes increasing demands on healthcare and social systems. Integrating the health and social service sectors has been proposed as a preferred solution to support healthy ageing, yet implementation in real settings remains challenging. Using an implementation science framework, this protocol outlines a Type-2 hybrid effectiveness-implementation design to adopt localized strategies for a Community-Based Health-Social Partnership Programme (C-HSPP) and test its effectiveness in enhancing self-care management among older adults in the community.

Methods This study has two primary foci: to evaluate both the effectiveness and the implementation outcomes of C-HSPP in a non-governmental organization that operates seven community elderly centres across Hong Kong. A cluster randomized controlled trial (CRCT) with a two-arm, matched-pair, pragmatic design has been adopted to evaluate the programme's effectiveness. Regarding implementation outcomes, the reach, adoption, implementation, and maintenance of the programme will be examined using multiple data sources with quantitative and qualitative data. The trial will include 732 older adults aged 60 or above from four matched pairs of community centres, with each paired centre randomly assigned to either the 12-week C-HSPP intervention or to the usual community services. The C-HSPP intervention features a comprehensive assessment-intervention-evaluation framework using the Omaha System with health-social case management. Data will be collected at three time-points: baseline, post-intervention, and three months post-intervention, with self-efficacy as the primary outcome and other health indicators as secondary outcomes. An effectiveness analysis will be conducted using mixed-effects models and generalized estimating equations, incorporating degrees-of-freedom corrections and adjustments for clustering. Regarding the implementation outcome analysis, quantitative data including service statistics and a satisfaction survey will be presented using descriptive analysis. Qualitative data involving interview transcripts will be analysed using directed content analysis.

Discussion By simultaneously evaluating both clinical effectiveness and implementation outcomes, this study will validate the evidence-based intervention and identify facilitators and barriers in the implementation process. The findings will support the adoption of an effective evidence-based programme in real-world settings, provide insights

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on the implementation process to ensure its sustainability, and furnish evidence for policymakers to adopt an integrated health-social partnership programme in the community.

Trial registration ClinicalTrials.gov, NCT05621720, First Posted on 2022–11-18.

Keywords Community-dwelling older adults, Effectiveness-implementation hybrid design, Health-social partnership, Implementation science, Primary health care, Self-care, Omaha system

Background

The global population is rapidly ageing, which will profoundly impact healthcare and social systems. By 2050, the number of people aged 65 years or over is expected to double to over 1.6 billion, and account for approximately 16.7% of the world's population [1]. This demographic shift will occur in Hong Kong, with an anticipated 36% of the population aged 65 or above by 2046 [2]. Individuals at an advanced age typically experience chronic illnesses [3], functional impairments [4], and cognitive decline [5], which will hinder their ability to manage their health independently. The result is an increasing reliance on healthcare services and long-term care support. To address these growing demands, it is therefore important to empower older adults to engage in self-care, which will enable them to maintain their health and independence [6].

Self-care, as defined by the World Health Organization (WHO) [6], encompasses the capacity of individuals, families, and communities to maintain optimal health, prevent diseases, and manage illnesses and disabilities with minimal professional intervention. Effective self-care management not only enhances the quality of life of older adults but also reduces their reliance on overstrecthed health and social systems [7]. Current self-care interventions programmes tend to predominantly focus on specific illnesess. A review by Riegel, Westland [8] of 233 self-care intervention studies found that the majority focussed on the management of specific conditions, such as Type 2 diabetes mellitus (36%), hypertension (14%), and heart failure (12%), while fewer than 10% addressed multimorbidity. Also, the interventions largely emphasized the physical dimensions of care, such as activities of daily living, dietary intake, and medication managements, while psychosocial support was seldom incorporated [8]. In reality, older adults face a range of challenges beyond physical health, including a decline in social activities and relationships, psychological health, and environmental constraints, all of which can significantly impact their ability to effectively practise self-care [9]. The inclusion of professional advice with coordinated services can support older adults in addressing the multifaceted challenges that they will face in later life [9]. Recognizing the complexity of the issues involved in supporting self-care, the World Health Organization (WHO) advocates an integrated care approach, one that involves interfacing healthcare services with community-based sectors (e.g., social care, housing, and welfare support) to provide comprehensive, person-centred care [10].

Integrated care models appear under various terminologies in the literature, including health-social partnerships [11, 12], organizational partnerships [13], joint working teams [14], interdisciplinary teams [15], collaboration between local healthcare and non-healthcare organizations [16], integrated person-centred care [17], or integrated health and social care services [18]. These models involve coordinated efforts between healthcare providers and social services organizations to develop and deliver comprehensive treatment plans that address the complex, multifaceted needs of individuals, particularly those with chronic conditions or members of vulnerable populations, such as the ageing population. The evidence suggests that such collaborative approaches enhance social participation, increase motivation for health goals, and improve overall well-being among older adults [19, 20]. At the macro level, integrated care promotes intersectoral coordination and policy alignment, contributing to improved resource utilization and equitable access to quality care [21].

Despite the conceptual deliberations and growing enthusiasm for community-based integrated care models, there is still insufficient evidence of their effectiveness, particularly those targeting older adults. Existing review articles have primarily reported moderate improvements in patient satisfaction, service accessibility, health service utilization, and perceived quality of care [22–24]. However, their impacts on health-related outcomes critical for older adults, such as physical functioning, effective chronic disease management, and psychosocial well-being, remain uncertain [16, 24–26]. Also, evidence related to the broader social determinants of health, such as social connectedness, loneliness, and depression, is either limited or inconclusive, indicating a significant gap in our understanding of the potential capacity of integrated care to improve the overall well-being of older adults [19, 27]. An umbrella review conducted by de Matos and do Nascimento [20] confirmed these limitations, identifying fragmented findings, a lack of standardized outcome measures, and reliance on small-scale pilot interventions with limited generalizability.

Researchers advocate expanding evaluation beyond conventional service-oriented outcomes (e.g., patient satisfaction and accessibility) to incorporate more patient-reported measures [17, 22]. One such measure is self-efficacy, which is an individual's belief in their ability to take control of their health and perform the behaviours necessary to manage their chronic conditions, maintain their functional independence, and respond to their health challenges [28]. Grounded in Bandura's Social Cognitive Theory [29], self-efficacy has been widely recognized as a key determinant of successful self-care behaviours. Empirical evidence supports self-efficacy as a critical determinant for medication adherence, symptom management, engagement in preventive health practices, and psychological well-being in older populations [30–32]. Self-efficacy can be a valuable standardized metric for evaluating the effects of integrated self-care interventions.

Our team previously developed and evaluated a 12-week community-based health-social partnership programme (C-HSPP) in a randomized control trial. Significant improvements were demonstrated in the older adults' self-efficacy, daily activities, quality of life, healthcare utilization [33], and depressive symptoms [34]. However, challenges were encountered in translating of the evidence-based model to real-world settings [35–37]. Our team therefore proceeded with the effectiveness-implementation design and conducted a hybrid Type 1 pilot study [12, 38]. Implementation science offers a structured and theory-informed approach to bridge the gap between research and practice by addressing not only what works, but also how, for whom, and under what circumstances interventions can be effectively implemented [27]. The pilot offered insights into the application of implementation science frameworks, including the need to secure leadership and management support, foster inter-agency coordination, deliver targeted staff training, and enhance provider competencies.

These findings align with evidence elsewhere confirming that the successful implementation of integrated care is highly contingent upon effectively managing multilevel interactions [14, 35, 37]. This includes attention to clinical practices, organizational dynamics, and system-wide structures—dimensions that have been described as micro-, meso-, and macro-levels of integration, respectively [28]. At the micro-level, clear role definitions, interprofessional relationships, and provider commitment are essential to ensure collaborative practice and trust within multidisciplinary teams [14, 35, 37]. At the meso-level, organizational readiness, leadership support, shared governance structures, and sufficient time and flexibility to develop supporting infrastructure have consistently emerged as critical organizational factors [14, 35, 37]. At the macro-level, alignment of policy frameworks and adequate political support significantly influence the sustainability and scalability of integrated interventions [14, 37].

Because the pilot study was limited by its focus on a single centre, and affected by the COVID-19 pandemic, which disrupted the protocolized home visit service delivery approach [12], a larger-scale study will therefore be launched. The use of a scaled-up cluster design facilitates implementation at the centre level, enabling organizational and contextual influences to be captured while enhancing the representativeness and generalizability of the findings across a wider range of community-based elderly service centres [39]. A Type 2 hybrid effectiveness-implementation design will be adopted. Specifically, the aims are: (1) to assess the effectiveness of the C-HSPP intervention in improving self-efficacy and other health outcomes using a cluster randomized controlled trial (CRCT); and (2) to evaluate the key implementation outcomes of C-HSPP, including the dimensions of reach, adoption, implementation, and maintenance.

Conceptual framework

This study is guided by two complementary conceptual frameworks: Bronfenbrenner's ecological theory model, which informs the design and structure of the intervention, and the RE-AIM framework, which guides the comprehensive implementation and evaluation plan of this hybrid effectiveness-implementation trial.

Bronfenbrenner's ecological theory model [40], which emphasizes the interplay of factors at multiple levels, provides the conceptual basis for the design and structure underpinning the effectiveness perspective of the C-HSPP care model. This theory is particularly suited to the self-care enhancement programme because it recognizes that the self-care practices of older adults are influenced not only by individual attributes but also by professional and organizational contexts. In the ecological theory, the levels of influence are depicted as microsystem, mesosystem, and macrosystem. At the microsystem level, the C-HSPP focuses on strengthening modifiable personal capacities, particularly self-efficacy, as conceptualized by Bandura's self-efficacy theory. Drawing on the findings of Wu and Sheng [41], the intervention bolsters the confidence of older adults in managing their health by leveraging strategies such as mastery experiences, observational learning, verbal encouragement, and emotional support. Empirical evidence further underscores that self-efficacy has a stronger influence on healthy ageing than health-promoting behaviours themselves, making it a pivotal mechanism in behavioural

change [41]. Enhancing self-efficacy thus equips older adults with the confidence and competence needed to actively manage their health and navigate age-related challenges. At the mesosystem level, the programme targets therapeutic relationships between older adults and health-social care providers. The Omaha System [42], a structured and standardized system, is used to provide a comprehensive assessment-implementation-evaluation programme to clients. The Omaha System has been validated locally [11, 12, 33] and has proven to be useful in facilitating integrated service delivery across health and social domains. At the broader macrosystem level, the intervention incorporates the Relational Coordination Theory of Gittell [43] to enhance organizational and professional collaboration and service integration among healthcare and social care sectors and their care professionals, ensuring the coordinated and continuous delivery of care. Relational coordination is a process that reinforces the interaction between communication and relationships to attain task integration, and is relevant in the current context involving individuals, professionals, and an organization [43].

For the implementation perspective, this study adopts the RE-AIM framework [44, 45] in conjunction with the Expert Recommendations for Implementing Change (ERIC) taxonomy [46] as a complementary framework to inform the development of an implementation strategy and guide the evaluation of the implementation process. RE-AIM provides an evaluative lens across five domains, namely, *Reach* (the extent of the population's engagement), *Effectiveness* (health outcomes), *Adoption* (provider and organizational uptake), *Implementation* (fidelity and delivery consistency), and *Maintenance* (long-term sustainability). Complementing this, the ERIC taxonomy offers a comprehensive menu of 73 strategies grouped into thematic clusters, including readiness assessment, stakeholder training, coalition building, and contextual tailoring, to support targeted improvements across these domains [47]. For instance, to improve Reach, strategies such as a local needs assessment and tailored educational outreach were used; for Adoption, stakeholder engagement through coalition-building and formal commitments was prioritized. During Implementation, ongoing training, facilitation, and feedback loops supported fidelity and adaptation. For Maintenance, strategies such as data sharing, local knowledge capture, and academic partnerships were embedded to support long-term sustainability. By mapping ERIC strategies to RE-AIM outcomes, this study ensures that implementation efforts are both actionable and measurable, ultimately increasing the likelihood that the C-HSPP model will be successfully scaled up and integrated into routine community practice [48, 49].

Methods

Study design

This study adopts a Type 2 effectiveness-implementation hybrid design trial to examine the effectiveness and outcomes of the intervention. The effectiveness of the C-HSPP will be evaluated using a cluster randomized control trial (CRCT) with a two-arm, matched-pair, pragmatic design conducted in multiple sites. The second objective focuses on evaluating the implementation outcomes in terms of Reach, Adoption, Implementation, and Maintenance. The trial is registered under ClinicalTrials.gov (identifier NCT05621720), and was first posted on 2022–11-18. The protocol of the hybrid trial was written according to the Standards Protocol Items: Recommendations for Interventional Trials (SPIRIT) [50]. The SPIRIT checklist for protocol reporting is provided in Appendix A. Table 1 outlines the schedule of enrolment, interventions, and assessments across the pre-implementation, implementation, and post-implementation phases.

Study context

This study takes place in the Hong Kong SAR, China, a region reported to enjoy long life expectancies, with men and women living up to 82.7 and 88.1 years, respectively [51]. Projections indicate that by 2046, individuals aged 65 or above will constitute over one third (36%) of the population, a great leap as compared to 16.6% in 2016 [2, 52]. This demographic shift underscores the increasing demand on social and healthcare services for older adults. The Elderly Services Programme Plan (ESPP) was developed in response to these challenges [53]. Its emphasis is on the necessity of forging partnerships among key stakeholders in social services and primary healthcare to address the needs of older adults in facilitating ageing in place and reducing reliance on institutional care [54]. However, local policy reports have highlighted the challenges involved in health-social partnerships, including poor coordination and operational inflexibility between the health and social sectors [55, 56]. This study therefore employs a hybrid Type 2 design of the implementation science approach in an attempt to facilitate the implementation process with stakeholder engagement, and at the same time evaluate the effectiveness of interventions in real-world settings.

The study is conducted in collaboration with the Hong Kong Lutheran Social Service (HKLSS) in eight subbases located in five government-subvented (one with two subbases) and two self-financed elderly centres in different regions of Hong Kong, each serving approximately 800 to 1,500 active members (https://www.hklss.hk/en/service-information/e-division). Although geographically

Table 1 Timeline of enrolment, interventions, and assessments according to SPIRIT

		Phase					
		Pre-implementation phase		Implementation phase			Post- Implementation phase
		Preparation	Allocation	*T_1 Subject Enrolment Pre-intervention*	*T2 (3-month) Intervention completed*	*T3 (6-month) 3 months post-intervention*	
ENROLMENT							
Logistics of Recruitment, Eligibility screening		X					
Training of the Intervention Team, Health Research Team, and Service Team		X					
Cluster matching and randomization			X				
Recruitment, Eligibility Screening			X	X			
Validation and Informed Consent		X (Centre-level)	X (Subject-level)				
INTERVENTIONS							
Usual Community Service				●	—	●	
C-HSPP (+ Usual Community Service)				●	—	●	
ASSESSMENTS							
Effectiveness Outcomes	*Baseline demographic data*			X			
	Primary Outcomes:						
	Self-efficacy			X	X	X	
	Secondary Outcomes:						
	Quality of Life			X	X	X	
	Loneliness			X	X	X	
	Pain			X	X	X	
	Depression			X	X	X	
	Medication adherence			X	X	X	
	Basic Activities of Daily Living			X	X	X	
	Instrumental Activities of Daily Living			X	X	X	
	Fall incidence			X	X	X	
	Body Mass Index, Blood Pressure, & Capillary Blood Glucose			X	X	X	
	Health Service Utilization			X	X	X	
Implementation Outcomes	Reach (Number of participants, retention, and attrition)	X	X	X	X	X	X
	Adoption (Representativeness and uptake of providers and organizations)	X	X	X	X	X	X
	Implementation (Fidelity, consistency of delivery, and satisfaction with the service)			X	X	X	X
	Maintenance (Facilitators and barriers to sustainability and implementation feedback)			X	X	X	X

diverse, all centres operate under the same corporate philosophy and management.

Study implementors

The team comprises the research team, the NGO director, centre managers, nurse case managers (NCMs), and social workers (SWs). Each will play a distinct yet complementary role in translating evidence-based research into contextually appropriate practices. Collectively, the team will address issues encountered throughout the implementation process [27].

The research team will lead the implementation science project from conceptualization through to the preparation and execution phases. Regular meetings will be convened at various stage of the project, facilitating members in developing, confirming, and refining implementation strategies, managing logistics, and ensuring adherence to the research protocol. The service team, including both the management team and frontline centre workers, will ensure that the intervention is contextually relevant, and that the roles are clearly delineated and coordinated.

The 12-week C-HSPP intervention will be led by an NCM, who will conduct assessments, provide education, and coordinate referrals. Each participating centre will assign an SW to collaborate closely with the NCM, jointly deliver the integrated intervention, and monitor the client's progress as appropriate. The community workers (CWs) will support the professional team by conducting follow-up telephone calls with the participants to facilitate continuity of care. The following section provides a detailed description of the components of the C-HSPP intervention and outlines the overall implementation strategy.

C-HSPP Intervention Components.

The C-HSPP intervention model implemented in this study is a 12-week, nurse-led, self-care promotion

Table 2 Outline of the 12-week C-HSPP intervention

Month	Week 1	Week 2	Week 3	Week 4
First	Nurse home visit	Nurse telephone call	CW telephone call	CW telephone call
Second	Nurse home visit		CW telephone call	
Third	Nurse telephone call			Nurse home visit

programme supported by a health-social partnership for community-dwelling older adults. The model was originally developed and empirically tested by our health research team [33]. It proved to be effective in enhancing measures of self-efficacy, activities of daily living (ADL), instrumental activities of daily living (IADL), and quality of life. The structured 12-week intervention was found to be of an adequate duration to enhance the self-efficacy for self-management and the overall well-being of the community-dwelling older participants [33, 57].

In the current study, which adopts the implementation science approach, we held discussions with management and frontline colleagues of the service centre to ensure that the C-HSPP is contextually appropriate for a real-world setting. Participants will receive three home visits and five telephone calls over the course of the intervention period, for a comprehensive assessment of their health and social needs and the delivery of the related intervention to support self-care management and wellness (see Table 2).

The Omaha System, a comprehensive assessment-intervention-evaluation framework developed by Martin [42] and tested for local use by Wong et al. [11, 12, 33], was used to guide the C-HSPP (see Table 3). The Omaha System is composed of four domains: environmental, psychosocial, physiological, and health-related behaviour, with a total of 42 problems. During the initial assessment, the NCM will identify health and social issues across the four domains. Based on the identified problems, the NCM and the older adult will collaboratively establish self-care management goals and an individualized care plan. The NCM will provide continuous support to the clients and empower them to take control of their own health and review the goals periodically during the intervention period. The NCM will provide interventions in accordance with the four intervention schemes of the Omaha System. These interventions are: teaching, guidance, and counselling; treatment and procedures; surveillance; and case management. The problems, in consultation with the health-social team, will be classified into health-focussed, social-focussed, and health-social-focussed. This is so that the problems can be addressed in accordance with the team's expertise and to enhance interprofessional collaboration. The NCM will primarily focus on health-related issues that require health education, nurse monitoring, and support for self-management. If medical attention is needed, such as for further investigation and treatment, the NCM will issue a referral letter detailing the health concern to facilitate the medical consultation. Afterwards, the NCM will follow up with the client. If social needs are identified during NCM home visits, such as a need for social service support, SWs will be referred to the clients for follow-up.

The NCM will monitor and rate the clients' progress in knowledge, behaviour, and status in accordance with the Omaha System and modify the care plan accordingly. To ensure smooth coordination between health and social services, regular case conferences will be conducted between the interdisciplinary research and service teams to review the client's progress, discuss the issues that were encountered, and possible solutions. Please see Table 3 for the application of the Omaha System in the C-HSPP.

Developing the implementation strategy

Informed by implementation science, this study draws on the ERIC framework [46] to guide the development and structuring of implementation strategies across three critical phases: pre-implementation, implementation, and post-implementation. The ERIC framework offers a standardized compilation of 73 discrete strategies grouped into thematic clusters (such as stakeholder engagement, capacity building, iterative evaluation, and sustainability planning) devised in the context of health-social partnerships that call for understanding and integrated work across professional boundaries, where the health and social services have historically occurred in silos and are somewhat fragmented [58, 59]. ERIC's flexibility allows strategies to be tailored to specific contextual demands, making it a practical tool for aligning implementation activities with the local operational realities and cultural nuances of each service setting.

As illustrated in Table 4, ERIC-informed strategies are selected and adapted to address evolving needs at each phase of implementation [47]. In the pre-implementation stage, an emphasis is placed on building readiness and a shared understanding through formal commitments, stakeholder engagement, and the development of a local implementation glossary. During the implementation phase, interactive training,

Table 3 Application of the Omaha System in the C-HSPP

Omaha System Component	Key Elements	Focus	Description
Problem Classification Scheme	Environmental, Psychosocial, Physiological, Health-Related Behaviours	Comprehensive Assessment of Health and Social Issues Categorizing concerns into three types: health-focussed, social-focussed, and health-social partnership-focussed	The NCM will use the Omaha System's Problem Classification Scheme to undertake an initial assessment of the needs of the older person **Health-focussed issues** will include concerns that are mainly related to the individual's health condition, and which will benefit from nurse interventions. They are mainly items in the physiological and health-related behaviours domains **Social-focussed issues** will involve concerns related to the social determinants of health, and which can be addressed with the interventions of SWs. They are mainly items in the environmental and psycho-social domains **Health–social–partnership-focussed issues** straddle needs that can be addressed by both health and social interventions. For instance, a client with a history of frequent falls will require nurse health education on gait balancing and benefit from the SW's support in seeking help to undertake renovation work to maintain a safe home environment
Intervention Scheme	Teaching, Guidance, and Counselling (TGC)	Education and Empowerment	The NCM will engage in the early identification of health risk factors, and provide the individual with tailored information and support to enhance their self-efficacy, by building confidence in their ability to engage in self-care health management
	Treatments and Procedures (TP)	Intervention Regime and Symptom Management	The NCM will conduct technical activities such as prescribing an exercise regime, and ensuring adherence to taking prescribed medication or other necessary regimes to alleviate symptoms
	Case Management (CM)	Service Coordination and Follow-up	The NCM will coordinate services by making referrals to specialized services (e.g., general/specialist medical practitioners, ED, SWs) as appropriate
	Surveillance (S)	Ongoing Monitoring of Health Status	The NCM will monitor the participants' health status to detect early changes in condition to allow for timely adjustments to be made to care plans if indicated
Problem Rating Scale for Outcomes	Knowledge, Behaviour, Status	Severity of Problems	The NCM will use the Omaha System's Problem Rating Scale to evaluate changes in the participants' knowledge, behaviour, and health status over time, to monitor the client's progress. The rating will range from 1 to 5. Knowledge reflects the ability to remember and interpret information (from no knowledge to superior knowledge). Behaviour represents observable responses, actions, or activities fitting the occasion/purpose (from not appropriate to consistently appropriate). Status refers to the overall condition in reference to the objective and subjective characteristics (from extreme signs/symptoms to no signs/symptoms)

continuous facilitation, regular team reflection, and fidelity monitoring are employed to strengthen interprofessional coordination and protocol adherence. In the post-implementation stage, strategies such as data feedback, knowledge sharing, and iterative adaptation are introduced to support sustainability and organizational learning. These strategies were co-designed by the research and service teams through ongoing dialogue and joint problem-solving, ensuring contextual appropriateness and operational feasibility across diverse community-based sites. By embedding ERIC strategies throughout the implementation process, this study enhances the strategic rigour and adaptability of its hybrid trial, laying a solid foundation for the sustainable integration of the C-HSPP model into routine practice.

Methods of objective 1: evaluating effectiveness

Study design

This study employs a two-arm, pair-matched, pragmatic C-RCT design to evaluate the effectiveness of adopting the C-HSPP intervention in enhancing self-care

Table 4 Key discussion items for the implementation strategies in the Pre-implementation, Implementation, and Post-implementation stages

Stage	Linked ERIC Strategies	Focus	Description
Pre-implementation	Conduct a local needs assessment	Identifying Needs and Resources	Identify local needs, resources, and barriers among older adults to guide implementation planning and staff training
	Build a coalition	Team Building and Engagement	Conduct site visits and meetings to identify champions, build stakeholder coalitions, and involve staff early
	Obtain Formal Commitments	Organizational Commitment	Secure written commitments from participant centres and staff clarifying roles and responsibilities to enhance readiness and accountability
	Develop a formal implementation blueprint & Tailor strategies	Team Alignment and Expectations	Establish clear implementation goals, roles, responsibilities, timelines to ensure smooth logistic operations and care coordination
	Conduct ongoing training	Capacity Building	Provide comprehensive training with clear referral criteria, structured pathways, standardized materials, and regular updates
Implementation	Organize implementation team meetings	Quality Assurance and Fidelity	Hold regular interdisciplinary case conferences and team meetings to ensure continuous quality improvement, fidelity checks, and problem-solving
	Facilitate & Purposely reexamine the implementation	Responsive Monitoring and Adaptation	Use real-time monitoring and rapid troubleshooting mechanisms to address emerging issues and adjust strategies
	Shadow other experts	Peer Learning and Support	Enable less experienced implementers to learn from early adopters, enhancing skills and adherence to protocols
Post-implementation	Facilitate the relaying of clinical data to providers	Data Sharing	Coordinate systematic data sharing for ongoing client monitoring and evaluation
	Capture and share local knowledge	Local Contextual Learning	Document local experiences; share insights across centres to support scalability and continuous improvement
	Promote network weaving	Sustainability and Scale-up	Leverage academic and inter-organizational networks to disseminate findings, promote long-term adoption, and enhance sustainability

management among community-dwelling older adults. At the cluster level, a community centre is the smallest experimental unit, not the individual [60, 61]. This C-RCT design has an administrative advantage in the delivery of services, as it ensures that all individuals within a centre will receive the same type of care without the risk of contamination that could occur with individual-level randomization. This approach allows the intervention to be implemented in a real-world setting, and in multiple centres, thus enhancing the generalizability of the findings.

The study involves seven community elderly centres, one of which operatres two subbases, treated as a single cluster. A pair-matching process will be applied to form four pairs of comparable cluster sets. The pairing of the centres will be based on their similarity in terms of the demographic background of their participants, drawing on data from the Hong Kong Government [2]. This process enhances comparability between the clusters and minimizes the effects of possible confounding background variables [62–64]. Please see Fig. 1 for the flow diagram.

Randomization and blinding process

After pair matching, four comparable pairs of cluster sets will be ready for assignment to either the intervention or control arm. Within each matched pair, non-identifiable labels to each of the centres will be generated using a computer randomization process. In the presence of key stakeholders from the research and service teams, the first label picked by the computer will be that for the intervention centre while the other will be for the control centre. This procedure will be repeated for all matched sets.

A single-blinded design will be adopted in this study. The participants and the intervention team (NCMs and

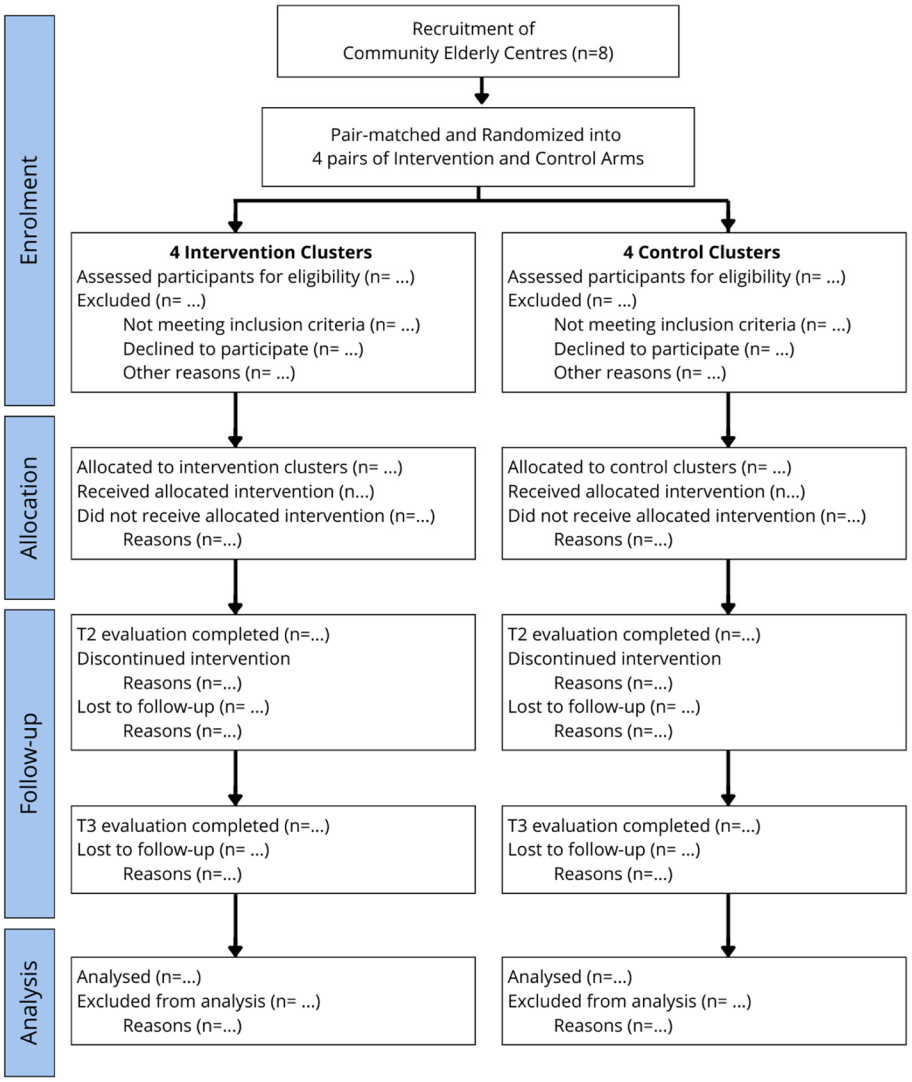

Fig. 1 Flow diagram illustrating the progress of clusters and individuals through all phases of the C-RCT

SWs) will inevitably be aware of their involvement in the intervention, making double-blinding impossible [65]. Several approaches will be employed to maintain objectivity in data collection and analysis. The research assistants responsible for data collection and the statistician who conducts the data analysis will be blinded to the group allocations.

Sample size and power calculation

The sample size for this C-RCT was estimated using guidelines from Hemming et al. [60] for studies with a fixed number of clusters to ensure that the minimum detectable difference is achieved. The approach involves inflating the sample size calculated for individual randomization by a design effect, which accounts for the intra-cluster correlation coefficient (ICC) under cluster randomization. First, the sample size for an individual RCT was determined based on the primary outcome (self-efficacy), measured using the General Self-Efficacy Scale (GSE) [66]. Informed by previous studies [67–70], the calculation was performed in R (version x64 4.0.5) based on a conservative effect size of 0.3. With an estimated power of 0.8 and an alpha of 0.05, it was determined that a total of 352 participants would be needed for individual randomization. To adjust for cluster-based studies set in primary care and community settings, the equation from Hemming et al. [60] was applied: $n_C = \frac{n_I k[1-p]}{[k-n_I p]}$, where n_I=352, k=8 (four clusters per arm), and an ICC of 0.01[62, 71]. This adjustment yielded a sample size of 622 participants. Accounting for a 15%

potential attrition rate based on studies using similar subject groups [33, 68], the final sample size was set at 732 participants (366 per arm).

Study participants and recruitment procedure

The target participants are older adults who live at home in their own community. Since this intervention is not targeted at individuals with particular diseases or health statuses, all older adults who are members of the study sites are potential subjects. Specifically, the inclusion criteria are: (i) People aged 60 or above, (ii) Living within the service areas of the respective community centres, and (iii) Cognitively competent, with a Hong Kong version of Montreal Cognitive Assessment (HK-MoCA) score of ≥ 22 [72]. The exclusion criteria are: (i) Not able to communicate, (ii) Not reachable by phone, (iii) Not living at home, (iv) Bed-bound, (v) With a serious mental illness requiring hospitalization in the recent 6 months, (vi) Already engaged in a similar structured health or social programme; and (vii) Will not be staying in Hong Kong for the next current three months.

Eligible participants will be identified through the community centres and approached by trained RAs, who will explain the study, give them the information sheet, obtain their written informed consent to participate in the study, and collect baseline data. A second RA, independent from the RA who was involved in the consent process, will then assist with confirming eligibility, arranging logistics, and scheduling programme activities with the assigned NCM.

Usual care and control group

Participants in both the intervention and control arms will continue to receive the usual community services provided at their respective centres. These routine services include community social activities and occasional health-related events, such as health talks arranged irregularly by the service centres. The intervention group will receive the structured 12-week C-HSPP intervention described above.

To account for potential social effects of the C-HSPP intervention, participants in the control group will receive a monthly social call from trained assistants. These calls will follow protocols used in prior studies [33] and will not include any health-related content. If the participants raise any health concerns, the assistants will direct them to consult their primary care providers.

Strategies to Ensure Intervention and Assessment Fidelity

To ensure that the C-HSPP programme is delivered as planned, the research team will provide training to the implementation team, including NCMs, SWs, and CWs.

The NCMs in this intervention need to be Registered Nurses with at least a bachelor's degree, and with extensive experience in community health or geriatric nursing. To equip them for their roles, the NCMs will undergo a 12-h case management training programme that encompasses theoretical input and case training. The NCMs will need to demonstrate competence in delivering the intervention and in adhering to the protocol in the training case before being allowed to work independently. The training materials have been adapted from a protocol formulated based on a validated, standardized training manual from an earlier study [33]. The contents of the training include: (a) assessment, intervention, and documentation using the Omaha system, (b) communication skills such as motivational interviewing and empowerment strategies, and (c) problem management, adopting a community-based health-social partnership approach.

The NCM team will establish a group to communicate among themselves for case discussions, to provide peer advice and mutual support, as well as to ensure consistent care delivery. For complex cases, case conferences among the interdisciplinary service and research teams will be held to review the care plan and provide feedback. Five percent of home visits and audiotaped telephone calls will be reviewed to ensure adherence to the intervention protocols and for quality assurance.

The SWs and CWs will also be trained. The three hours of training for the SWs will include instruction in the following key areas: (a) the aim and objectives of the study, (b) the logistic workflow, and (c) the handling of the social cases and the referral cases. The CWs who are responsible for the telephone follow-up will be required to attend six hours of training. The content of the training will consist of information on home safety, healthy lifestyles, communication skills, social resources, elderly psychology, service ethics, and referrals for professional help. All of the CWs will have to pass a test before being assigned to services. Five per cent of the audiotaped telephone calls will be reviewed to ensure compliance with the protocols.

A three-hour training and practice session will be provided to the assistants responsible for collecting data. The assistants will be required to complete a mock exercise on collecting data. The inter-rater reliability will be computed using the intraclass correlation coefficient (ICC), with a value of 0.90 or greater considered an acceptable indication of the reliability of the inter-rater measurement's precision [73].

Data Collection and Measurements

Data collection will occur at three intervals: at baseline before the intervention (T1), at the completion of the three-month intervention (T2), and three months

post-intervention (T3). Data will be gathered by the research assistants in a quiet room at the community centres.

Measuring Effectiveness Outcomes

Measuring treatment effectiveness

Self-efficacy is used as the primary outcome measure. It is a significant indicator of one's confidence in performing self-care [74] and a pre-requisite for successful self-management [70].

Our previous research identified five top common health problems encountered by older persons dwelling in the community. They are pain, nutrition, neuro-muscular-skeletal problems, medication adherence, and mental health issues [33]. These health concerns are therefore included in the outcome measures. Other secondary outcomes involve subjective well-being (i.e., quality of life, pain, depressive symptoms, and loneliness), objective measures of well-being (i.e., blood pressure, random glucose, body mass index, fall incidence, medication adherence, basic and instrumental activities of daily living), and health service utilization.

Primary outcome

Self-efficacy

The General Self-efficacy scale (GSE) was developed based on Bandura's social cognitive theory [29], which was later refined to a 10-item version that was translated into Chinese [75]. The scale items are rated on a four-point Likert scale, ranging from 1 (not at all true) to 4 (exactly true). The total score ranges from 10 to 40, with higher scores indicating greater self-efficacy, meaning a stronger belief in one's ability to handle one's health conditions. A local study showed a high internal consistency, with a Cronbach's alpha of 0.89 among older Chinese adults [75].

Secondary outcomes

Quality of life

Quality of life will be measured using the 12-item Short Form Health Survey version 2 Chinese (HK) version (SF-12v2) [76]. The questionnaire includes the scales of physical functioning, role limitation due to physical problems, role limitation due to emotional problems, mental health, bodily pain, general health, vitality, and social functioning. These yield two summative scores on Physical and Mental Components. Each SF-12v2 domain is scored from 0 to 100, with higher scores indicating better perceived health status or functioning. Among older Chinese adults, a previous study reported a Cronbach's alpha of 0.81 for the Physical Component Summary and 0.83 for the Mental Component Summary, confirming strong reliability and a two-factor structure (physical and mental health) [77].

Depressive symptoms

The 15-item Chinese version of the Geriatric Depression Scale (GDS) will be used to assess levels of depression among community-dwelling older adults [78]. The scale has shown good validity and reliability among the elderly Chinese population. The maximum score is 15 (the higher the score, the more severe the depression) with a score of ≥ 8 regarded as an indication of depressive symptoms. The internal consistency was found to be satisfactory, with a Cronbach's alpha coefficient of 0.89 [79].

Loneliness

Loneliness will be measured using the six-item Chinese version of the De Jong Gierveld Loneliness Scale [80]. This scale has two subscales for social and emotional loneliness plus an overall loneliness score, with a Cronbach's alpha of 0.76 demonstrating acceptable reliability among older Chinese adults. Scores of 0–1, 2–4, and 5–6 in the scale represent "no", "moderate", and "severe loneliness" respectively, indicating thresholds for categorizing levels of loneliness.

Falls

Fear of Falling will be assessed using the single question of "Are you afraid of falling?" on a four-point Likert scale (i.e., never, rarely, sometimes, or often) [81]. This brief measure has demonstrated good test–retest reliability, with a reported kappa coefficient of 0.72 [82], supporting its utility for screening older populations in the aspect of fear of falling. The incidence of falls will be measured by asking participants how many times they have fallen in the past three months, based on the definition that a fall is an unintentional event where a person ends up on the ground or against a lower surface [83]. Subjects will be asked to complete a fall diary and report the incidence of falls the past three months at the time of data collection.

Medication adherence

The outcome of medication adherence will be measured using the Adherence to Refills and Medications Scale, which is a 12-item reporting measure to assess the respondent's ability to take and refill all prescribed medications under different circumstances [84]. The options vary from "none of the time" to "all of the time", with total scores ranging from 12–48, and with lower scores indicating better adherence. The scale has shown validity in identifying the medication adherence issues of community-dwelling older adults, with a Cronbach's alpha of 0.821 indicating high internal consistency [85].

Basic activities of daily living

The basic activities of daily living (BADL) will be measured using the Modified Barthel Index—Chinese version, which measures performance in 10 basic activities of daily living (feeding, dressing, grooming, bathing, toileting, bed-chair transfer, bladder and bowel control, ambulation, and stair climbing) [86]. It is measured using a five-point Likert scale from 1 = totally dependent to 5 = fully independent, producing a total score ranging from 10 to 100, with higher scores indicating greater functional independence. The internal consistency was found to be satisfactory, with a Cronbach's alpha coefficient of 0.89 [86].

Instrumental activities of daily living

The instrumental activities of daily living will be measured using the Lawton Instrumental Activities of Daily Living (IADL) Scale—Chinese version, a four-point scale with nine items of activities, namely, use of the telephone, transportation, shopping, meal preparation, housework, handyman work, laundry, medication management, and money management [87]. Scores range from 0 to 27, with higher totals indicating greater IADL capacity. A local validation study reported a Cronbach's alpha of 0.86, demonstrating good internal consistency and confirming the validity of the scale for assessing the ability of older Chinese adults to live independently [87].

Health service utilization

The outcomes of health service utilization include the total number of unplanned general Out-Patient Department (GOPD) visits, general practitioner (GP) visits, emergency department (ED) visits, and hospital admissions. This information will be collected from the participants' subjective reports on the number of times they have made use of healthcare services within the last three months at the data collection time-points of T1, T2, and T3. The subjective reports will be confirmed with medical and attendance certificates [33].

Objective measures of well-being

For each data collection time-point, blood pressure (BP), capillary blood glucose (CBG), and body mass index (BMI) will be measured. Blood pressure (BP) will be measured using a calibrated electronic sphygmomanometer. Hypertension will be defined according to the Hong Kong Reference Framework for Hypertension Care for Adults in Primary Care Settings, with systolic blood pressure present at (SBP) ≥ 140 mm Hg or diastolic blood pressure (DBP) at ≥ 90 mm Hg [88]. CBG will be measured using a portable glucometer, with regular calibration checks to maintain accuracy. According to the Hong Kong Reference Framework for Diabetes Care, target CBG values are 4–7 mmol/L for pre-prandial (fasting) glucose and 5–10 mmol/L for postprandial glucose, taken 2 h after a meal [89]. BMI will be calculated using the formula weight (kg) / height^2 (m^2). Weight will be recorded using a regularly calibrated scale, and height will be measured using a stadiometer while the participants wear light clothing and no shoes. According to the BMI classification for Chinese adults adopted by the Centre for Health Protection [90], a normal BMI range is 18.5 to 23 kg/m^2.

Baseline demographic data

The baseline demographic data of the subjects that will be collected will consist of the following 11 items: gender, age, marital status, education, occupation, living place, living status, economic status, source of income, caregiver information, and the frequency of their caregiver's visits. The instrument's reliablity was validated in a prior study [33].

Data analysis plan

The statistical analysis for this study will be structured to evaluate the effectiveness of the C-HSPP in a two-arm, pair-matched C-RCT. All analyses will adhere to the intention-to-treat (ITT) principle, including ensuring that all participants remain in the group to which they were initially assigned, which will help to mitigate bias due to dropouts or non-compliance [91].

Descriptive statistics will summarize the baseline demographic and clinical characteristics of older adults in both the intervention and control arms. Continuous variables (e.g., self-efficacy, quality of life) will be presented as means with standard deviations or medians with interquartile ranges, depending on their distribution. Categorical variables (e.g., living status, educational level) will be summarized using frequencies and percentages. Baseline comparability across groups will be assessed using appropriate statistical tests: t-tests or Wilcoxon rank-sum tests for continuous variables and chi-square tests for categorical variables. These comparisons will help in assessments of comparability between the two arms and will be used to identify any significant baseline differences between them that may require adjustments in subsequent analyses [62].

The inferential analysis will incorporate random intercepts for matched pairs within mixed-effects models to account for any variability between them, ensuring that differences observed between the intervention and control groups are not confounded by differences between the matched pairs. To estimate the intervention effect size, mixed-effects models will be used at the individual level, incorporating clustering factors to appropriately adjust for the hierarchical structure of the data. For

continuous outcomes, such as the primary outcome of self-efficacy measured across the T1, T2, and T3 data collection points, linear mixed-effects models will include fixed effects for the intervention group and random effects for clusters to adjust for intra-cluster correlations [92]. Given the relatively small number of clusters (n = 8), we will apply degrees-of-freedom corrections such as the Kenward-Roger method to enhance the precision of standard error estimates [92, 93]. For binary outcomes, we will employ generalized linear mixed models (GLMMs) using the Between-Within denominator degrees of freedom approximation method to improve the performance of the Wald F test [93]. We will also use generalized estimating equations (GEE) with small-sample corrections, such as the Kauermann-Carroll adjustment, to ensure proper Type I error control [92]. Count-data outcomes, such as the number of healthcare visits, will be analysed using Poisson or negative binomial regression models, depending on the presence of overdispersion. Additionally, exploratory analyses will be conducted to investigate whether the effects of the intervention differ across specific subgroups, such as those differing in socio-economic status and age, by including interaction terms in the models. For the analyses, a two-tailed significance level of < 0.05 will be considered statistically significant.

Addressing missing data is crucial to maintaining the validity of our findings. Multiple imputation methods under the assumption that data are missing at random (MAR) will be employed with the application of the pattern-mixture model approach in SAS 9.4 analytics software [94]. Rubin's rules will be applied to combine results across these datasets, accounting for imputation uncertainty [95]. To determine whether data are MAR or potentially missing not at random (MNAR), we will perform diagnostic checks, such as examining patterns of missingness and assessing the relationships between observed variables and the likelihood of missing data.

Sensitivity analyses will be conducted to assess the robustness of the findings under different assumptions about missing data mechanisms, including scenarios where data may be MNAR. For these analyses, approaches such as using pattern-mixture models or selection models to simulate different MNAR scenarios will be applied to evaluate changes in the estimates [94]. Additionally, outliers will be identified by conducting sensitivity analyses that involve excluding extreme values to reduce the influence of outliers while preserving the overall structure of the data [96]. All analyses will be performed using SAS 9.4 analytics software, with R used for additional validation as needed. The plan of analysis may be refined based on interim findings or evolving study needs, ensuring flexibility and robustness in our approach.

Methods for Objective 2: Implementation evaluation

Study design

A mixed-methods design will be employed to assess the implementation of the C-HSPP in real-world settings. This design will allow the team to assess both implementation outcomes and the implementation process, using qualitative and quantitative data. The RE-AIM framework will be used to guide the evaluation, which will be conducted by assessing four key implementation dimensions, namely, reach, adoption, implementation, and maintenance; and also facilitate an exploration of how contextual factors influence the success of the implementation or the challenges that are encountered in the implementation [97].

This mixed-methods approach will provide a comprehensive understanding of both the "what" (implementation outcomes) and the "how" and "why" (implementation process). It allows for context-specific insights into how C-HSPP is adapted to local needs, as well as potential barriers to scaling up the process. Data will be collected from multiple sources, including administrative records, participant logs, surveys, focus group interviews, and documents such as meeting minutes [97, 98], as shown in Table 5.

Reach

Reach refers to the absolute number, proportion, and representativeness of the older adults who are willing to participate in C-HSPP, including their retention and attrition rates [99, 100]. Key demographics such as age, gender, and health status will be documented to ensure the representativeness of the sample. Enrolment routes will also be tracked to analyse how the participants were recruited. Participant engagement will be evaluated by tracking both the number and characteristics of the participants after enrolment. Monitoring retention and attrition rates throughout the intervention will help to identify barriers to sustained participation, with reasons for exclusion or dropout recorded to provide insights into factors that may prevent eligible individuals from engaging with the programme.

Adoption

Adoption will involve determining the absolute number, proportion, and representativeness of settings and intervention agents willing to initiate a programme [44, 98]. For C-HSPP, adoption is assessed at multiple levels to understand the extent of integration into existing community elderly services. At the setting level, we will document the number and characteristics of the participating HKLSS centres, analysing their representativeness compared to the broader population of elderly service centres

Table 5 Plan for Implementing the Outcome Evaluation

Dimension	Definition	Measured Construct	Data Sources
Reach	The absolute number, proportion, and representativeness of older adults who are willing to participate in C-HSPP and complete the programme	- Number and characteristics of participants and non-participants - Enrolment routes - Retention and attrition rates - Reasons for exclusion or non-participation	- Administrative records - Participant enrolment logs
Adoption	The absolute number, proportion, and representativeness of settings and intervention agents willing to initiate a programme	- Number and characteristics of participating centres - Representativeness of settings - Staff-level Adoption - Organizational Adoption	- Service providers (management perspective) - Individual Interviews with SWs - Meeting minutes
Implementation	The degree to which the intervention is delivered as intended and the satisfaction of participants and providers	- Fidelity measures: adherence to intervention protocol, quality of delivery - Management of health-social dimensions - Number of referrals and reasons - Survey of satisfaction among the participants	- Client documentation and service audiotapes - Individual group interviews with NCMs and SWs - Meeting minutes - Participants Satisfaction surveys
Maintenance	The extent to which C-HSPP is sustained over time and integrated into routine practice	- Long-term sustainability strategies - Facilitators and barriers to sustaining the intervention - Potential for scalability to other settings	- Meeting minutes - Focus group interviews with participants - Individual group interviews with NCMs and SWs

in Hong Kong. Staff-level adoption will be evaluated by gathering feedback from service providers who agreed to deliver the C-HSPP during the early uptake and adoption period, with particular attention to how their professional backgrounds and experience influenced their participation. The examination of organizational adoption will focus on formal decisions made by the management of the centre to implement the programme and how it was integrated into existing service delivery structures. Data collection methods include interviews with service providers, analysis of meeting minutes, and organizational documentation.

Implementation

Implementation will be about assessing the extent to which C-HSPP was delivered as designed (fidelity), how feasible it is to address the complex needs of the service recipients, and their satisfaction with the programme [98, 101]. Fidelity is defined as how closely and consistently the intervention team follow established protocols, such as those relating to service time and practice alignment with the Omaha System. Five percent of the client documentation and call audiotapes will be reviewed to check adherence to the set protocol. Feasibility will be assessed by examining how the Omaha System facilitated the intervention health-social team in identifying and managing issues of concern among the older adults. This process will include studying case management records and referrals to evaluate the functionality of these partnerships in practice, with specific criteria for making referrals and tracking their outcomes.

To provide further insights into the implementation experience, satisfaction will be measured using an adapted 15-item questionnaire completed post-intervention by the participants. Qualitative insights from individual interviews with NCMs and SWs and group interviews with participants will provide a deeper understanding of implementation experiences. Minutes from formal (e.g., case conferences) and informal meetings (e.g., NCM group discussions) will offer context on the challenges that were encountered and the strategies that were used to address them.

Maintenance

Maintenance will be about focusing on the long-term sustainability of C-HSPP after its implementation and the scalability of its integration into routine practice [98, 101]. This dimension involves evaluating whether key components of the intervention have been maintained over time and exploring both the facilitators and barriers to sustainability. To explore long-term sustainability, discussions among the research and service teams that were documented in meeting minutes will be reviewed to identify facilitators and barriers to ongoing implementation. Focus group interviews with the participants and individual interviews with NCMs and SWs will be conducted to gather qualitative insights on the practical sustainability of the intervention. Based on stakeholder feedback collected during these interviews, the potential scalability of the intervention will also be evaluated by assessing whether C-HSPP can be adapted for use in other community settings.

Data sources and collection

A mixed-methods approach will be employed to gather both quantitative and qualitative data to evaluate the outcomes and the process of implementing C-HSPP. Data sources will include mainly implementation-related documents and guided interviews. The documents will consist of administrative records, participant enrollment logs, meeting minutes, nurse documentation archives, referral forms, and case discussion notes. The interview guides have been drawn up based on the 39 constructs across five domains of the Consolidated Framework for Implementation Research (CFIR), namely, the characteristics of the intervention, the outer setting, the inner setting, the characteristics of individuals, and the implementation process [102]. These CFIR constructs provide an analytical lens to inform and contextualize the RE-AIM framework, which guides the overall evaluation of this hybrid trial. For example, within the Adoption domain—referring to the extent to which community centres and providers are willing to initiate and integrate the intervention—CFIR constructs such as *relative advantage*, *compatibility*, and *organizational readiness for implementation* may shape how stakeholders perceive the value and feasibility of the programme. These perceptions, in turn, would influence their willingness to adopt the intervention, which is critical for achieving sustained integration into routine practice. A sample interview guide for community centre staff is provided in Appendix B, which includes probing questions used with frontline staff.

Sampling and subject recruitments

Purposive sampling will be used to strategically recruit participants who can provide diverse and in-depth insights into the adoption, implementation, and maintenance of the intervention. The sampling strategy will include two approaches, both homogenous and heterogeneous purposive sampling as recommended by Ritchie, Lewis [103]. First, we will use homogenous purposive sampling for key informants based on specific criteria related to their roles in the intervention. For example, all service providers directly involved in the intervention (NCMs, SWs, and dedicated support staff from the centre) will be invited to participate in individual interviews to capture a wide range of professional experiences and insights into how the intervention was delivered and sustained. The criterion-based sampling will also include centre managers or administrators who oversaw the implementation process. This will provide insights into organizational-level factors influencing adoption and sustainability.

Second, among the C-HSPP participants (older adults), we will use heterogeneous purposive sampling to form focus groups based on shared health and social needs. All of the participants will be asked if they are willing to join a focus group interview at the post-intervention data collection period (T2). This method will allow us to explore how differently the intervention impacted various subgroups, enhancing the richness of the qualitative data.

Given that depth over breadth is emphasized in qualitative research, we anticipate recruiting approximately 10–15 NCMs, SWs, and centre staff for individual interviews, and 16–20 focus groups of older adults involved in C-HSPP, with each intervention cluster comprised of 4–5 groups, each with 3–4 participants. New informants will be recruited continuously until data saturation is reached. Data saturation refers to informational redundancy, and it occurs when additional sampling provides no new information, only redundancy of previously collected data [104, 105].

Data analysis

Qualitative data analysis

The qualitative data will be analysed using a combination of deductive and inductive thematic analyses [106]. The CFIR framework will be used for deductive coding to systematically assess contextual factors influencing the implementation outcomes[102]. This deductive approach ensures that key constructs such as organizational readiness, leadership engagement, and external policy support are thoroughly examined. Simultaneously, an inductive thematic analysis will capture emergent themes related to the specific characteristics of the intervention within the RE-AIM framework [97]. This inductive approach allows us to explore novel insights that arise directly from the participants' experiences and interactions with the intervention. This dual approach allows us to integrate both predefined theoretical constructs from CFIR and novel insights that arise directly from the data. All interviews will be transcribed verbatim, and relevant meeting notes and documents will be treated as raw data.

The analytical process, inspired by the thematic analysis guidelines of Braun and Clarke [107], will involve several key steps. First, all qualitative data—including transcribed interview transcripts, meeting notes, service documentation, referral forms, and case discussion logs—will be treated as raw data and imported into NVivo 14 for organization. NVivo's advanced features will allow us to efficiently manage large datasets while ensuring transparency in our coding process through its audit trail functionality. The health research team will then familiarize themselves with the data by reviewing all transcripts and documents to identify preliminary patterns and insights. The materials will all be combed through line-by-line and numerous times, using

deductive and inductive coding approaches. Each piece of text will be assigned to one or more codes that capture its significance or meaning.

Following the initial coding, a working analytical framework will be developed through an iterative process. The health research team will then meet regularly to refine and adjust the coding scheme, ensuring that it captures both conceptual constructs (i.e., CFIR) and emerging insights The coded data will then be organized into a framework matrix, with information summarized from each data source under relevant codes and themes. This matrix will facilitate systematic comparisons across cases while preserving the original context of the data.

The final interpretation will involve identifying overarching themes and patterns, and developing them into cohesive narratives that bring together diverse participant experiences and real-world environments. These themes will go beyond simple topic summaries to offer interpretive insights that reveal deeper connections within the data.

To enhance the rigour of our thematic analysis, several measures will be taken. An audit trail will be maintained throughout the process of analysis to document coding decisions and develop themes. Two researchers will independently code approximately 10% of the transcripts to assess inter-coder reliability, with discrepancies resolved through team discussions until a consensus is achieved. Additionally, reflexivity will be embedded in the analysis, encouraging researchers to reflect on their assumptions and consider how these may influence the interpretation of the data.

Quantitative data analysis

Quantitative data collected from administrative records (e.g., enrolment logs) and participant satisfaction surveys will be analysed using descriptive statistics such as means, frequencies, and percentages when summarizing key variables related to Reach (e.g., number of participants enrolled), Adoption (e.g., staff intention to implement), Implementation (e.g., fidelity scores), and Maintenance (e.g., cost evaluation).

Ethical considerations

This study adheres to the principles outlined in the Declaration of Helsinki for research involving human subjects [108] and has received ethical approval (Reference number: HSEARS20210401002) from the Institutional Review Board of the study university. Both the organization and the participants will be provided with an information sheet detailing the purpose, procedures, risks, and benefits of participation, and given their written informed consent to participate. Confidentiality will be strictly maintained. The participants are free to withdraw from the study at any time without penalty. None of the participants are being deprived of the health and social services that they normally receive.

Trial status

Recruitment for this CRCT commenced in June 2022 and the project is now in the follow-up phase of data collection. Following the completion of the CRCT intervention phase, data on implementation outcomes will be finalized in the coming months. Concurrently, individual and focus group interviews with key stakeholders, focusing on the implementation process, are underway and expected to be completed by Q2 2025. A data analysis will be conducted simultaneously to ensure the timely integration and interpretation of the findings.

Discussion

This paper presents a pragmatic and evidence-based protocol for implementing and evaluating the Community-based Health-Social Partnership Programme (C-HSPP), an integrated care model designed to enhance self-care management among community-dwelling older adults. By employing a Type 2 hybrid effectiveness-implementation design, this study addresses a persistent gap between research and practice—focusing not only on whether integrated care works, but also on how, why, and under what conditions it can be successfully adopted in real-world settings.

In contrast to earlier studies that have typically focused on either clinical effectiveness or examined the challenges of implementation, this study adopts a Type 2 hybrid design that deliberately blends both components to offer a comprehensive evaluation of the C-HSPP intervention. By simultaneously testing clinical outcomes and assessing implementation strategies, the study seeks to shorten the time lag between research and real-world practice, as originally intended by Curran and Bauer [109]. By employing a cluster randomized controlled trial (C-RCT), the study enhances the generalizability of the findings while accounting for the real-world complexity of community care settings. A wide range of subjective (e.g., self-efficacy, quality of life, depressive symptoms, loneliness) and objective (e.g., pain, falls, BMI, blood pressure, healthcare utilization) outcomes will be assessed, addressing longstanding concerns about inconsistent measurement in integrated care evaluations. Simultaneously, the study examines the reach, adoption, implementation, and maintenance of the intervention through the RE-AIM framework, enriched by contextual insights from CFIR constructs. This dual focus not only strengthens the evidence base but also provides service providers and policymakers with actionable knowledge on feasibility, acceptability, and scalability, factors essential for engaging in the decision-making process

and informed by the adoption and institutionalization of integrated care models [110]. These efforts are in response to ongoing calls for more rigorous research on the effectiveness of interventions, and to demonstrate measurable health and psychosocial impacts [22, 24, 37], as well as for implementation-oriented studies that can illuminate pathways for scaling and sustaining health-social care integration [21, 27, 35].

Beyond its research contribution, this study also has practical implications for strengthening local service delivery. The findings from the C-HSPP study are expected to provide valuable, evidence-based recommendations tailored to Hong Kong's healthcare landscape. Informed by the WHO's recommendation for context-sensitive integration strategies [10], this project involves the active engagement of frontline staff, the development of contextually appropriate protocols, and the cultivation of cross-sectoral collaboration, all of which support sustained practice beyond the trial. The implementation experiences and co-developed strategies will remain embedded in service sites, enhancing the long-term viability and social impact of the intervention. These efforts may also inform broader organizational and policy-level shifts toward more accessible, coordinated, and efficient eldercare systems in Hong Kong.

The current work reinforces the evolving role of primary healthcare as a central platform for integrated service delivery, particularly through the strategic use of community-based health and social care resources. Aligned with global health priorities, including the Astana Declaration and the WHO's operational framework for primary health care [111], the C-HSPP demonstrates how integrated, person-centred approaches can shift systems away from reactive, disease-focused care and toward prevention, empowerment, and value-based service delivery. Ideally, the ability of an effective integrated health-social care model to deliver continuous and coordinated services will not only enhance individual outcomes but also promote health equity, reduce avoidable healthcare utilization, and strengthen population health systems [20]. If the outcomes of this study are as anticipated, C-HSPP has the potential to serve as a scalable model for community-based care, and will help to operationalize population-level health management and support the sustainable transformation of primary health systems employing a health-social approach.

In conclusion, this C-HSPP protocol represents a meaningful step toward bridging the persistent implementation gap in integrated care targeting self-care management among older people. It has the potential to offer both practical solutions and policy-relevant insights for strengthening primary healthcare systems in increasingly ageing societies.

Abbreviations

BADL	Basic Activities of Daily Living
BMI	Body Mass Index
BP	Blood Pressure
CBG	Capillary Blood Glucose
CFIR	Consolidated Framework for Implementation Research
CRCT	Cluster Randomized Controlled Trial
C-HSPP	Community-Based Health-Social Partnership Programme
CW / CWs	Community Worker(s)
ED	Emergency Department
ERIC	Expert Recommendations for Implementing Change
GDS	Geriatric Depression Scale
GEE	Generalized Estimating Equations
GSE	General Self-Efficacy Scale
GP	General Practitioner
GOPD	General Out-Patient Department
HK	Hong Kong
HKLSS	Hong Kong Lutheran Social Service
HK-MoCA	Hong Kong version of the Montreal Cognitive Assessment
IADL	Instrumental Activities of Daily Living
ICC	Intraclass Correlation Coefficient
MAR	Missing At Random
MNAR	Missing Not At Random
NCM / NCMs	Nurse Case Manager(s)
RCT	Randomized Controlled Trial
RE-AIM	Reach, Effectiveness, Adoption, Implementation, and Maintenance
SF-12v2	12-Item Short Form Health Survey Version 2
SPIRIT	Standard Protocol Items: Recommendations for Interventional Trials
SW / SWs	Social Worker(s)
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

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Authors' contributions

FKYW and AKCW conceptualized the study. WYYK, FKYW, AKCW, JB provided intellectual input on the design, methodology, and evaluation of the study. WYYK wrote the first draft, and all authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study was approved by the Institutional Review Board of the Hong Kong Polytechnic University (No. HSEARS20210401002). The study followed the Declaration of Helsinki. Written informed consent will be signed by all subjects prior to their participation.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. United Nations, *World Social Report 2023: Leaving No One Behind In An Ageing World*, in *World Social Report*. 2023, Department of Economic and Social Affairs: New York : UN.
2. Census and Statistics Department. 2021 population census: summary results. Hong Kong Special Administrative Region; 2022. Available from: https://www.census2021.gov.hk/doc/pub/21csummary-results.pdf.
3. Smith ML, et al. Self-care difficulties and reliance on support among vulnerable middle-aged and older adults with chronic conditions: A cross-sectional study. Maturitas. 2017;104:1–10.
4. Imaginário C, et al. Functional capacity and self-care profiles of older people in senior care homes. Scand J Caring Sci. 2020;34(1):69–77.
5. Zeng Y, et al. Improvements in survival and activities of daily living despite declines in physical and cognitive functioning among the oldest-old in China – Evidence from a cohort study. The Lancet (British edition). 2017;389(10079):1619–29.
6. World Health Organization, *WHO consolidated guideline on self-care interventions for health: sexual and reproductive health and rights*. 2019: World Health Organization.
7. Mayo-Wilson E, et al. Preventive Home Visits for Mortality, Morbidity, and Institutionalization in Older Adults: A Systematic Review and Meta-Analysis. PLoS ONE. 2014;9(3): e89257.
8. Riegel B, et al. Characteristics of self-care interventions for patients with a chronic condition: A scoping review. Int J Nurs Stud. 2021;116: 103713.
9. Abdi S, et al. Understanding the care and support needs of older people: a scoping review and categorisation using the WHO international classification of functioning, disability and health framework (ICF). BMC Geriatr. 2019;19(1):195–195.
10. World Health Organization, *WHO global strategy on people-centred and integrated health services: interim report*. 2015, World Health Organization.
11. Wong AKC, et al. Effectiveness of a health-social partnership program for discharged non-frail older adults: A pilot study. BMC Geriatr. 2020;20(1):339–339.
12. Wong AKC, et al. A community-based health–social partnership program for community-dwelling older adults: a hybrid effectiveness–implementation pilot study. BMC Geriatr. 2022;22(1):1–789.
13. Smith KE, et al. Partners in health? A systematic review of the impact of organizational partnerships on public health outcomes in England between 1997 and 2008. J Public Health. 2009;31(2):210–21.
14. Cameron A, et al. Factors that promote and hinder joint and integrated working between health and social care services: a review of research literature. Health Soc Care Community. 2014;22(3):225–33.
15. Martin-Giacalone, B.A. and S. and Weng, *Interdisciplinary Team Roles and Challenges in Integrated Health Care Settings: Social Workers' Perspectives.* Social Work in Public Health: p. 1–11.
16. Alderwick H, et al. The impacts of collaboration between local health care and non-health care organizations and factors shaping how they work: a systematic review of reviews. BMC Public Health. 2021;21(1):753.
17. Kirvalidze M, et al. Effectiveness of integrated person-centered interventions for older people's care: Review of Swedish experiences and experts' perspective. J Intern Med. 2024;295(6):804.
18. Kelly L, et al. Measures for the integration of health and social care services for long-term health conditions: a systematic review of reviews. BMC Health Serv Res. 2020;20:1–11.
19. Karacsony S, et al. What are the Clinical and Social Outcomes of Integrated Care for Older People? A Qualitative Systematic Review. Int J Integr Care. 2022;22(3):14.
20. de Matos RC, et al. Implementation and impact of integrated health and social care services: an umbrella review. J Public Health Policy. 2024;45(1):14–29.
21. Briggs AM, et al. Elements of integrated care approaches for older people: a review of reviews. BMJ Open. 2018;8(4):e021194–e021194.
22. Liljas AEM, et al. Impact of Integrated Care on Patient-Related Outcomes Among Older People - A Systematic Review. Int J Integr Care. 2019;19(3):6–6.
23. Islam MS, et al. Does integrated healthcare system reduce the cost of quality of care for older people?: A scoping review. Asia Pacific journal of health management. 2019;14(2):74–84.
24. Baxter S, et al. The effects of integrated care: a systematic review of UK and international evidence. BMC Health Serv Res. 2018;18(1):350–350.
25. Ndumbe-Eyoh S, Moffatt H. Intersectoral action for health equity: a rapid systematic review. BMC Public Health. 2013;13(1):1056.
26. Looman WM, Huijsman R, Fabbricotti IN. The (cost-)effectiveness of preventive, integrated care for community-dwelling frail older people: A systematic review. Health Soc Care Community. 2019;27(1):1–30.
27. Sadler E, et al. The contribution of implementation science to improving the design and evaluation of integrated care programmes for older people with frailty. J Integr Care. 2019;27(3):232–40.
28. Valentijn PP, et al. Understanding integrated care: A comprehensive conceptual framework based on the integrative functions of primary care. Int J Integr Care. 2013;13(1):e010–e010.
29. Bandura A, Self-efficacy : the exercise of control. New York. New York: W.H. Freeman; 1997.
30. Baskaran T B, P., P. Raghav, and K.H.S. Naveen, *Hybrid model of care for older persons for improvement of frailty index—a community-based interventional study in an urban setting.* BMC Geriatrics, 2024. **24**(1): p. 772.
31. Pierobon A, et al. Psychosocial and behavioral correlates of self-efficacy in treatment adherence in older patients with comorbid hypertension and type 2 diabetes. Health Psychology Report. 2023;11(3):188–99.
32. Wang W, et al. Association between medication literacy and medication adherence and the mediating effect of self-efficacy in older people with multimorbidity. BMC Geriatr. 2023;23(1):378.
33. Wong AKC, Wong FKY, Chang K. Effectiveness of a community-based self-care promoting program for community-dwelling older adults: a randomized controlled trial. Age Ageing. 2019;48(6):852–8.
34. Wong AKC, Wong FKY. The psychological impact of a nurse-led proactive self-care program on independent, non-frail community-dwelling older adults: A randomized controlled trial. Int J Nurs Stud. 2020;110:103724–103724.
35. Kirst M, et al. What works in implementation of integrated care programs for older adults with complex needs? A realist review. Int J Qual Health Care. 2017;29(5):612–24.
36. Stadnick NA, et al. Comparative case studies in integrated care implementation from across the globe: a quest for action. BMC Health Serv Res. 2019;19(1):899.
37. Thomson LJM, Chatterjee HJ. Barriers and enablers of integrated care in the UK: a rapid evidence review of review articles and grey literature 2018–2022. Front Public Health. 2024;11:1286479–1286479.
38. Wong, A.K.C., et al., *A health-social service partnership programme for improving the health self-management of community-dwelling older adults : a hybrid effectiveness-implementation pilot study protocol.* 2023.
39. Curran, G.M., et al., *Reflections on 10 years of effectiveness-implementation hybrid studies.* Frontiers in Health Services, 2022. **2**.
40. Bronfenbrenner, U., *The ecology of human development : experiments by nature and design*. 1979, Cambridge, Mass.: Cambridge, Mass. : Harvard University Press.
41. Wu F, Sheng Y. Social support network, social support, self-efficacy, health-promoting behavior and healthy aging among older adults: A pathway analysis. Arch Gerontol Geriatr. 2019;85: 103934.

42. Martin, K.S., *The Omaha system : a key to practice, documentation, and information management*. 2nd ed.. ed. 2005, St. Louis, Mo.: St. Louis, Mo. : Elsevier Saunders.
43. Gittell JH. Relationships between Service Providers and Their Impact on Customers. Journal of service research : JSR. 2002;4(4):299–311.
44. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am J Public Health. 1999;89(9):1322–7.
45. Glasgow, R.E., et al., *The Application and Evolution of the Practical, Robust Implementation and Sustainability Model (PRISM): History and Innovations.* Global Implementation Research and Applications, 2024.
46. Powell BJ, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. Implementation science : IS. 2015;10(1):21–21.
47. Balis LE, Houghtaling B, Harden SM. Using implementation strategies in community settings: an introduction to the Expert Recommendations for Implementing Change (ERIC) compilation and future directions. Translational Behavioral Medicine. 2022;12(10):965–78.
48. Birken SA, et al. Criteria for selecting implementation science theories and frameworks: results from an international survey. Implement Sci. 2017;12(1):124–124.
49. Glasgow RE, Emmons KM. How can we increase translation of research into practice? Types of evidence needed. Annu Rev Public Health. 2007;28:413–33.
50. Chan A-W, et al. SPIRIT 2013 statement: Defining standard protocol items for clinical trials. Ann Intern Med. 2013;158(3):200–7.
51. Centre for Health Protection, *Life Expectancy at Birth (Male and Female), 1971 - 2020*. 2021, Department of Health.
52. Census and Statistics Department, *Hong Kong Population Projections 2017–2066*. 2017.
53. Elderly Commission, *Elderly services programme plan*, in *Hong Kong Special Administrative Region Government*. 2017.
54. HKSAR. *The Cheif Executive's 2021 Policy Address - Public Healthcare System*. 2021 6 Oct 2021; Available from: https://www.policyaddress.gov.hk/2021/eng/p130.html.
55. Bauhinia Foundation Research Centre, *Healthcare for All: Why and How?* 2019.
56. Hong Kong Policy Research Institute, *Aging in Place: Family and coomunity care and support 2017*. 2017.
57. Wong KC, Wong FKY, Chang KKP. Health-social partnership intervention programme for community-dwelling older adults: a research protocol for a randomized controlled trial. J Adv Nurs. 2015;71(11):2673–85.
58. Bolton R, Logan C, Gittell JH. Revisiting Relational Coordination: A Systematic Review. J Appl Behav Sci. 2021;57(3):290–322.
59. Rundall TG, et al. Contributions of relational coordination to care management in accountable care organizations: Views of managerial and clinical leaders. Health Care Manage Rev. 2016;41(2):88–100.
60. Hemming K, et al. Sample size calculations for cluster randomised controlled trials with a fixed number of clusters. BMC Med Res Methodol. 2011;11(1):102–102.
61. Dron L, et al. The role and challenges of cluster randomised trials for global health. Lancet Glob Health. 2021;9(5):e701–10.
62. Campbell MJ, Donner A, Klar N. Developments in cluster randomized trials and Statistics in Medicine. Stat Med. 2007;26(1):2–19.
63. Ivers NM, et al. Allocation techniques for balance at baseline in cluster randomized trials: a methodological review. Trials. 2012;13(1):120.
64. Rutterford C, Copas A, Eldridge S. Methods for sample size determination in cluster randomized trials. Int J Epidemiol. 2015;44(3):1051–67.
65. Campbell MK, Consort, et al. statement: extension to cluster randomised trials. BMJ. 2010;2012:345.
66. Chiu, F.P.F. and H.W.H. Tsang, *Validation of the Chinese general self-efficacy scale among individuals with schizophrenia in Hong Kong.* International Journal of Rehabilitation Research, 2004. **27**(2).
67. Mehta DH, et al. Building Resiliency in a Palliative Care Team: A Pilot Study. J Pain Symptom Manage. 2016;51(3):604–8.
68. Chow SKY, Wong FKY. A randomized controlled trial of a nurse-led case management programme for hospital-discharged older adults with co-morbidities. J Adv Nurs. 2014;70(10):2257–71.
69. Jiang W, et al. Effectiveness of a nurse-led multidisciplinary self-management program for patients with coronary heart disease in communities: A randomized controlled trial. Patient Educ Couns. 2020;103(4):854–63.
70. Zimmermann T, et al. Collaborative nurse-led self-management support for primary care patients with anxiety, depressive or somatic symptoms: Cluster-randomised controlled trial (findings of the SMADS study). Int J Nurs Stud. 2016;63:101–11.
71. Adams G, et al. Patterns of intra-cluster correlation from primary care research to inform study design and analysis. J Clin Epidemiol. 2004;57(8):785–94.
72. Yeung PY, et al. A validation study of the Hong Kong version of Montreal Cognitive Assessment (HK-MoCA) in Chinese older adults in Hong Kong. Hong Kong Med J. 2014;20(6):504–10.
73. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. J Chiropr Med. 2016;15(2):155–63.
74. Eller LS, Lev EL, Yuan C, Watkins AV. Describing self-care self-efficacy: definition, measurement, outcomes, and implications. Int J Nurs Knowl. 2018;29(1):38–48.
75. Leung DYP, Leung AYM. Factor structure and gender invariance of the Chinese General Self-Efficacy Scale among soon-to-be-aged adults. J Adv Nurs. 2011;67(6):1383–92.
76. Lam ETP, et al. Is the SF-12 version 2 Health Survey a valid and equivalent substitute for the SF-36 version 2 Health Survey for the Chinese? J Eval Clin Pract. 2013;19(1):200–8.
77. Su SW, Wang D. The Reliability and Validity of Short Form-12 Health Survey Version 2 for Chinese Older Adults. Iran J Public Health. 2019;48(6):1014–24.
78. Chi I, et al. Prevalence of Depression and Its Correlates in Hong Kong's Chinese Older Adults. Am J Geriatr Psychiatry. 2005;13(5):409–16.
79. Chan A, Yu E, Tsui W. Choosing a self-report depression scale for studying Chinese elderly people in Hong Kong. Hong Kong Journal of Gerontology. 1997;11:313.
80. Leung, G.T., J. de Jong Gierveld, and L.C. Lam, *Validation of the Chinese translation of the 6-item De Jong Gierveld Loneliness Scale in elderly Chinese.* Int Psychogeriatr, 2008. **20**(6): p. 1262–72.
81. MacKay S, et al. Fear of Falling in Older Adults: A Scoping Review of Recent Literature. Canadian geriatrics journal CGJ. 2021;24(4):379–94.
82. Oh-Park M, et al. Transient Versus Persistent Fear of Falling in Community-Dwelling Older Adults: Incidence and Risk Factors. Journal of the American Geriatrics Society (JAGS). 2011;59(7):1225–31.
83. McDonald C, et al. A prospective study of the association between orthostatic hypotension and falls: definition matters. Age Ageing. 2017;46(3):439–45.
84. Kripalani SMDM, et al. Development and Evaluation of the Adherence to Refills and Medications Scale (ARMS) among Low-Literacy Patients with Chronic Disease. Value Health. 2009;12(1):118–23.
85. Jin H, Kim Y, Rhie SJ. Factors affecting medication adherence in elderly people. Patient Prefer Adherence. 2016;10:2117–25.
86. Leung SOC, Chan CCH, Shah S. Development of a Chinese version of the Modified Barthel Index — validity and reliability. Clin Rehabil. 2007;21(10):912–22.
87. Tong, A.Y.C. and D.W.K. Man, *The Validation of the Hong Kong Chinese Version of the Lawton Instrumental Activities of Daily Living Scale for Institutionalized Elderly Persons.* OTJR (Thorofare, N.J.), 2002. **22**(4): p. 132–142.
88. Primary Care Office, *Hong Kong Reference Framework for Hypertension Care for Adults in Primary Care Settings, Revised Edition 2021*. 2021.
89. Primary Care Office, *Hong Kong Reference Framework for Diabetes Care for Adults in Primary Care Setting, Revised Edition 2023*. 2023.
90. Centre for Health Protection. *Main ContentBody Mass Index Chart*. 2019; Available from: https://www.chp.gov.hk/en/resources/e_health_topics/pdfwav_11012.html.
91. Tripepi G, et al. Intention to treat and per protocol analysis in clinical trials. Nephrology. 2020;25(7):513–7.
92. Leyrat C, et al. Cluster randomized trials with a small number of clusters: which analyses should be used? Int J Epidemiol. 2018;47(1):321–31.
93. Li P, Redden DT. Comparing denominator degrees of freedom approximations for the generalized linear mixed model in analyzing binary outcome in small sample cluster-randomized trials. BMC Med Res Methodol. 2015;15:1–12.

94. Yuan, Y. Sensitivity analysis in multiple imputation for missing data. in Proceedings of the SAS Global Forum 2014 Conference:[http://support.sas.com/resources/papers/proceedings14/SAS270–2014.pdf]. 2014.
95. Lee KJ, Simpson JA. Introduction to multiple imputation for dealing with missing data. Respirology. 2014;19(2):162–7.
96. Aguinis H, Gottfredson RK, Joo H. Best-practice recommendations for defining, identifying, and handling outliers. Organ Res Methods. 2013;16(2):270–301.
97. Feldstein AC, Glasgow RE. A practical, robust implementation and sustainability model (PRISM) for integrating research findings into practice. Jt Comm J Qual Patient Saf. 2008;34(4):228–43.
98. Harden SM, et al. RE-AIM in Clinical, Community, and Corporate Settings: Perspectives, Strategies, and Recommendations to Enhance Public Health Impact. Front Public Health. 2018;6:71.
99. David.H, P., T. Nhan.T, and A. Taghreed, Implementation Research in Health: A Practical Guide. Geneva. Geneva: World Health Organization; 2013.
100. Peters DH, et al. Implementation research: what it is and how to do it. BMJ : British Medical Journal. 2013;347: f6753.
101. Proctor E, et al. Outcomes for Implementation Research: Conceptual Distinctions, Measurement Challenges, and Research Agenda. Administration and policy in mental health and mental health services research. 2011;38(2):65–76.
102. Damschroder LJ, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci. 2009;4(1):50–50.
103. Ritchie J, et al. Designing and selecting samples. Qualitative research practice: A guide for social science students and researchers. 2003;2:111–45.
104. Cope, D.G., *Methods and meanings: Credibility and trustworthiness of qualitative research.* Number 1/January 2014, 2013. **41**(1): p. 89–91.
105. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. Soc Sci Med. 2022;292: 114523.
106. Gale NK, et al. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC Med Res Methodol. 2013;13(1):117–117.
107. Braun V, Clarke V. Toward good practice in thematic analysis: Avoiding common problems and be(com)ing a knowing researcher. Int J Transgend Health. 2023;24(1):1–6.
108. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191–4.
109. Curran GM, et al. Effectiveness-implementation Hybrid Designs: Combining Elements of Clinical Effectiveness and Implementation Research to Enhance Public Health Impact. Med Care. 2012;50(3):217–26.
110. Tops L, et al. Integrated care models for older adults with depression and physical multimorbidity: a scoping review. Int J Integr Care. 2023;23(S1):60.
111. World Health Organization, *Declaration of Astana.* 2018: Global Conference on Primary Health Care: Astana, Kazakhstan, 25 and 26 October 2018.

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