주제발표
Session 02

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Integrating Frailty and Intrinsic Capacity through the ICOPE Framework

Optimising INtrinsic Capacity for Functional INdependence and to Impede FrailTY in Older Adults: Adaptation of the WHO-ICOPE for Healthy Ageing in Singapore (INFINITY-ICOPE)

Funded by National Innovation Challenge Grant Call on Frailty (2023-2027)

In collaboration with: Singapore General Hospital, Changi General Hospital, Sengkang General Hospital, National Dental Centre Singapore, Polyclinics Singhealth, DukeNUS Medical School, SUSS, NUS, Geriatric Education & Research Institute, University of the Sunshine Coast Queensland, Australia, aic

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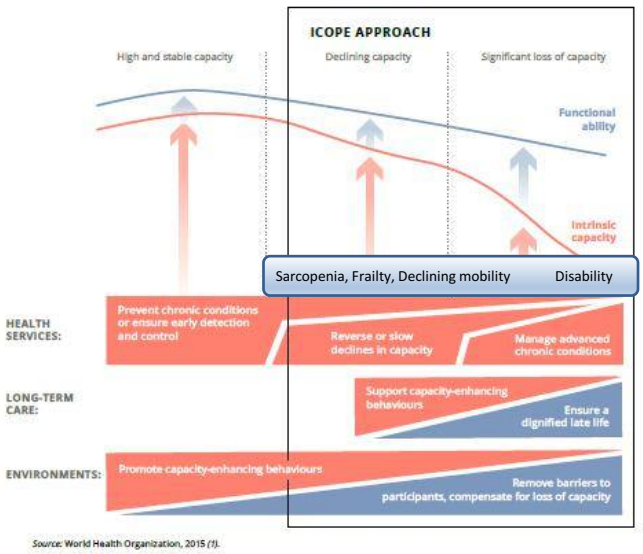
Intrinsic Capacity : Composite of Physical and Mental Capacities an Individual can Draw Upon

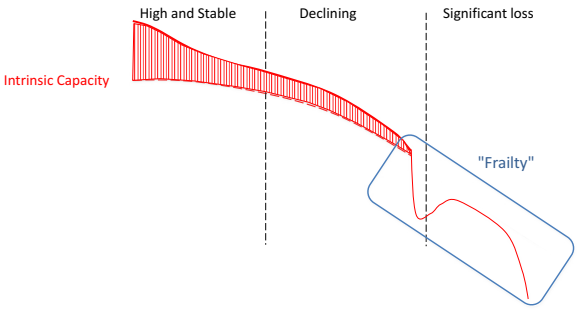
FIGURE 2. A PUBLIC-HEALTH FRAMEWORK FOR HEALTHY AGEING: OPPORTUNITIES FOR PUBLIC HEALTH ACTION ACROSS THE LIFE COURSE



Source: World Health Organization, 2015 (1).

- Key domains of intrinsic capacity are potentially **modifiable**
- Need for **efficient identification** of early declines → ICOPE Step 1
- **Effective interventions** to optimize intrinsic capacity → tapping on community resources
- Domains of IC interact at various levels → **Integrated Approach** to Screening, Assessment, Management

Intrinsic Capacity and Frailty on a Common Trajectory



Frailty is a geriatric syndrome characterized by diminished physiological reserves, increasing vulnerability of the older adult to stressors → risk of adverse outcomes

Declining IC underlies the diminished homeostatic reserves culminating in extreme vulnerability of the frail older person

Intrinsic capacity and 1-Year health outcomes in older adults

Self-rated Health	Fall Risk	Decline in Instrumental ADLs	Deterioration in health status
B=2.68 (1.62-3.73)	OR=0.76 (0.65-0.90)	OR=0.64 (0.50-0.83)	OR=0.70 (0.58-0.84)

Adjusted for age, gender, comorbidities

IC and frailty complementary in their common goal of disability prevention through the maintenance of functionality

L Tay et al. J Frailty Aging 2022

Intrinsic Capacity Decline Precedes Frailty Onset

- Loss of intrinsic capacity is highly prevalent
- Intrinsic capacity decline evident even among robust older adults
- 55% of robust (non-frail) older adults had at least 2 IC domain losses
- Prefrailty reversal with multi-modal intervention influenced by IC

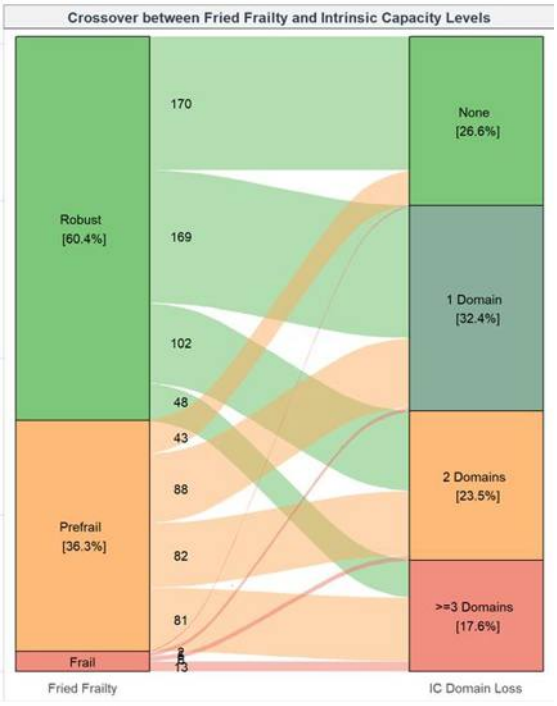


Fig 1. Relation between frailty and IC

L Tay et al. J Frailty Aging 2022
L Tay et al. Front Med 2022

Feasibility of Assessing ICOPE Domains using Secondary Data from IPPT-S

ICOPE Step 1	Dataset variable	Definition of positive screen
Cognitive Decline	Derived from C-MMSE ○ 3-word recall ○ Orientation to date and place	Unable to recall all 3 words and/or wrong response to orientation
Limited Mobility	5-Chair stand test	>=12s (Asian and local cut-off)
Malnutrition	MNA-short form ○ Weight loss >3kg in 3 months ○ Loss of appetite	Weight loss >3kg in 3 months and/or appetite loss (rated as moderate or severe decrease)
Visual Impairment	"Problem due to poor vision"	Yes
Hearing Loss	"Problem due to poor hearing"	Yes
Depressive Symptoms	Geriatric Depression Scale ○ Feeling down, depressed or hopeless Do you feel pretty worthless the way you are now? Do you feel that your situation is hopeless? ○ Little interest or pleasure in doing things Have you dropped many of your activities and interests?	Positive answers to any of the screening questions

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ASSOCIATION OF INTRINSIC CAPACITY ON ICOPE STEP 1 WITH FRAILTY

1164 older adults, mean age 67.8 (6.9) years, 72% female

90% screened positive for decline in at least 1 IC domain

20% with CFS 4 (very mild frailty), 18.5% CFS 5-7 (mild to severe frailty)

ICOPE Domain	Number (%) with decline
Cognition	886 (77%)
Locomotion	272 (24%)
Vitality	116 (10%)
Sensory	363 (31%)
Psychological	393 (35%)

Number of Domains with Decline	Number (%) of individuals affected
1	396 (36%)
2	352 (32%)
3	180 (16%)
4	59 (5%)
5	12 (1%)

ASSOCIATION OF INTRINSIC CAPACITY ON ICOPE STEP 1 WITH FRAILTY

Step 1 ICOPE	CFS 4 (Living with very mild frailty)	CFS 5-7 (Living with mild to severe frailty)
Cognitive decline	1.167 [0.804,1.693]	0.894 [0.608,1.315]
Locomotion decline	1.105 [0.752,1.624]	**1.786**** [1.228,2.596]
Vitality decline	**2.115**** [1.326,3.373]	**1.677*** [1.008,2.791]
Sensory decline	**2.394***** [1.741,3.292]	**1.453*** [1.026,2.057]
Psychological decline	**2.015***** [1.453,2.794]	**1.782***** [1.265,2.511]

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Adjusted for age, gender, ethnicity, education, social vulnerability, and presence of multimorbidity

ASSOCIATION OF INTRINSIC CAPACITY ON ICOPE STEP 1 WITH FRAILTY

Diagnostic Performance of Cumulative IC Decline in Identifying Frail Individuals						
Cumulative IC decline	Sensitivity	Specificity	PPV	NPV	LR+	LR-
(>= 1)	93.2%	11.7%	39.50%	73.40%	1.06	0.58
(>= 2)	66.0%	52.8%	46.40%	71.50%	1.40	0.64
(>= 3)	34.4%	84.7%	58.20%	67.60%	2.24	0.77
(>= 4)	11.8%	96.9%	70.40%	63.90%	3.84	0.91
(>= 5)	1.9%	99.4%	66.70%	62.00%	3.23	0.99

Decline in ≥4 IC domains - high specificity and positive predictive value for identifying patients at high risk of frailty

➢ Target for multidisciplinary assessment and intervention (CGA)

Feasibility of ICOPE Step 1 by Community Assessors

WHO ICOPE Training Workshop — **42** lay volunteers trained to be ICOPE assessors

ICOPE Step 1 + Care Plan Discussion — **367** older adults aged ≥60 years completed Step 1 screen by trained assessors

Focus Group Discussions — **25** ICOPE assessors shared experiences

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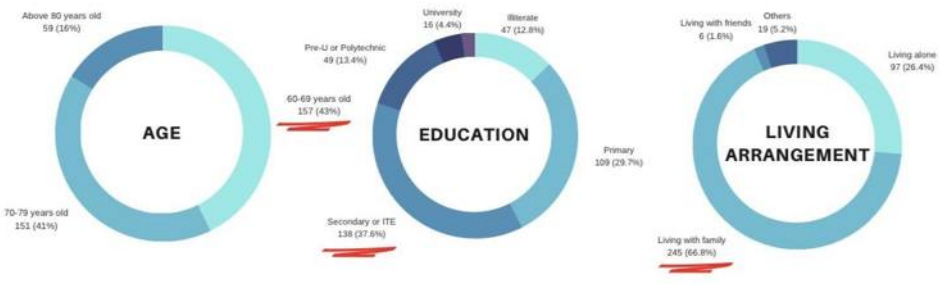
Results – Demographic characteristics (n=367)



Did not know where to go if any problems were flagged out during assessment

Not aware of any elder care services in the community

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Results - Level of intrinsic capacity impairment of older adults in Singapore (N=367)

77.4%

Have impairment in any of the 6 intrinsic capacity domains
N=367

Concordant with previous cross-sectional studies among Asian older adults (Leung et al., 2022; Ma et al., 2020)

42.0%

Vision Impairment

33.5%

Hearing Loss

31.3%

Cognitive Decline

24.3%

Limited Mobility

16.1%

Mal-nutrition

16.1%

Depressive Symptoms

Feasibility of using ICOPE in Singapore

> "In our discussion we find the ICOPE easy to administer and it could help family members to better determine if a health check is needed and which area to focus as a start."

> The ICOPE initiative presents a chance for older person to take charge of their own health with the support of their loved ones and community - giving us hope in that Singaporeans can age longer and healthier in time to come.

Enablers	Barriers
ICOPE is easy to manage, and it doesn't **take up** a lot of time. It is **person centered** and can **empower** our older adults to take charge of their health.	**Manpower constraints?**
Assessment of intrinsic capacity domains have **already been applied in practice** in the form of existing tools and programmes	**Competency of assessors to conduct Step 2?**
Integrated care models and **health system infrastructures** - similar to Steps 2 - 5 - are in place	**Buy-in from primary care partners?**
Echoes Healthier SG, a population health strategy for Singapore	**How to integrate ICOPE into current AACs while they are all using other tools as a funding requirement?**

Agenda: Promote Functional Ability and Minimize Care Dependency in an Ageing Population

Environments
Services, Community, Systems

Anticipated doubling in disability among Singaporean older adults by 2050: 1 in 6 older adults with ADL disability; 1 in 3 with iADL disability *(Chen C, J Econ Ageing)*

Intrinsic Capacity → **Functional Ability** → **Healthy Ageing**

Frailty

Rationale for integrating frailty and IC:

1. IC decline is highly prevalent, exceeds frailty prevalence locally *(Tay et al, JFA)*
2. IC decline increases risk for incident frailty and frailty progression *(Tay et al, JFA)*
3. IC decline and frailty contribute to adverse health events
4. Prefrailty reversal is dependent on baseline IC *(Tay et al, Front Med)*

Addressing the Gaps in Current Frailty Screening Approaches

Current Model	INFINITY-ICOPE
• Simplified dichotomization fails to address frailty complexity • Objective frailty measures ideal but not feasible in community • "One-size-fits-all" multi-domain interventions for frailty	• Parallel IC and frailty screen flag key frailty contributors • SCREENii provides automated and objective frailty measures • IC framework identifies individual deficits for personalized care

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INFINITY-ICOPE – Integrated Frailty and IC Screening

Key Objectives:

1. To maintain **functional independence** in older adults, represented by life-space mobility reflecting their community participation
2. To **implement INFINITY-ICOPE with high fidelity, penetration and sustainability** within the community

Efficient screening strategy → **Stratify for targeted intervention** → **Personalized care** → **Optimal health outcomes**

Technology-enabled Screening

Frailty
SCREENii automated Fried measures

+

5 IC Domains
EMPOWER App with Step 1 ICOPE

High and stable IC, Robust	Declining IC, Robust/ Prefrail	Significant IC loss, Frail
Primary Prevention Lifestyle interventions with behaviour nudges	**Secondary Prevention** Step 2 clarifies specific IC losses, targeted interventions	**Tertiary Prevention** Comprehensive Geriatric Assessment at Geriatric Services Hub sites
Build and maintain IC and resilience	Reverse, stop or slow loss of IC	Support IC recovery or compensate for loss

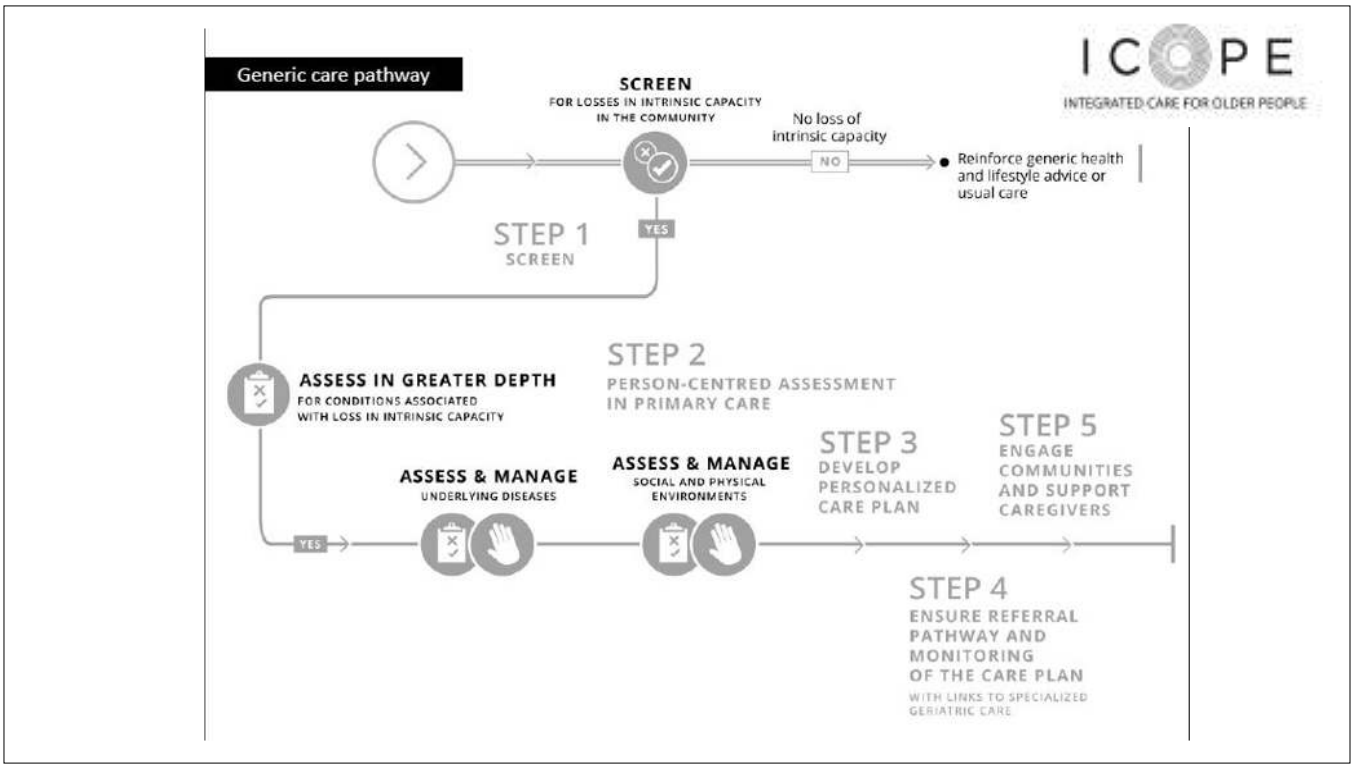
Key Components of INFINITY - ICOPE

Training of community partners and primary care providers in screening for frailty and IC decline

Developing care pathways for integrated care in the community

Technology (SCREENii) to **automate frailty measurements**

Digital tool (EMPOWER App) for **self-assessment of IC and self-management**



INFINITY-ICOPE – From Screening to In-Depth Assessment and Management

IC decline unlikely

CGA @ GSH

Frail +

Further assessment of affected IC domains (CNPs)

Frail – but failing Step 1 ICOPE

STEP 1: First Contact Frailty + ICOPE Step 1

Robust & no IC decline

IC loss likely

STEP 2
Person-centred assessment

STEP 3
Personalized care plan

STEP 4
Referral pathways, specialist links

Reassessment
Every 6 months

Supported by primary care & community partners – ASPIRE, GRACE clinics

AIC anchor
Care coordination, geriatric support, MDMs

Repeat STEP 1
Every 6 months

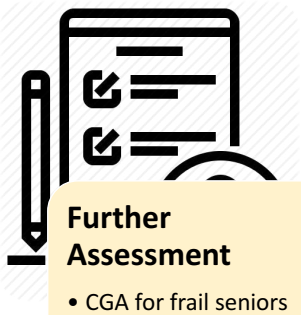
AIC: Agency for Integrated Care
GSH: Geriatric Services Hub (SHP, SATA, GP partners)
CNPs: Community Nurse Posts
GRACE: Primary Care Memory Clinics
MDMs: multidisciplinary meetings over Zoom

From case-finding through further assessment and integrated care pathways

Case Finding

- Adapting ICOPE Level 1 Screening to integrate frailty and IC assessment

Active Ageing Centres



Further Assessment

- CGA for frail seniors
- Step 2 assessment for conditions associated with IC loss in non-frail
- Assess & manage underlying diseases

Community Nurse Posts
Primary Care Clinics (ASPIRE)

Integrated Care

- Establishing referral pathways to specialist care
- Case management in community
- Multi-disciplinary engagement

Supported by regional hospital
MDMs as platform for communication

Services Established to Support Steps 2-5 of ICOPE

Community Nurse Posts in NorthEast

- Health and geriatric assessment
- Chronic disease monitoring and health coaching
- Medication education and support
- Care coordination with relevant agencies
- Home visits and tele-consultation for home-bound seniors

Bringing care close to where seniors live
– co-located within Active Ageing Centres

Services Established to Support Steps 2-5 of ICOPE

Geriatric Services Hub in NorthEast

- Community-based Comprehensive Geriatric Assessment for frail older adults
- Patients are followed for up to 12-months
- Clinical services provided by a multi-disciplinary team:
  - Doctors: Family physicians, geriatricians
  - Nurses
  - Case managers, Medical social worker
  - Physiotherapists (PT)
  - Occupational Therapists (OT)
  - Dietitians (DT), Speech Therapists (ST)

For more info, please contact:

aspire@skh.com.sg

Overview of ASPIRE partner network

Adapting the ICOPE Approach in Singapore

Step 1

Rapid **case finding** for frailty and declines in intrinsic capacity

Steps 3-5

Design a **person-centred care plan**

Step 2

Comprehensive assessment for seniors with identified frailty or intrinsic capacity declines

- Physical Activity & Resistance Exercises — Locomotion
- Nutritional Education & Supplementation — Vitality
- Cognitive Stimulation — Cognition, Psychological
- Home Adaptation to Prevent Falls

Example of Targeted Interventions: Locomotion

AACs/ self-assessment

Mobility Screen
Time for 5 chair stands

Completes 5 chair stands within 12 seconds → **Link to Physical Activity resources on EMPOWER**
- Singapore Physical Activity Guidelines
- ActiveSG programmes for enrolment
- Nutrition education

Unable to complete 5 chair stands without using arms or time taken >12 seconds → **CNPs**

Assess Mobility
Short Physical Performance Battery (SPPB)

Impaired Mobility
SPPB score 0-9

ASPIRE

Assess & Manage conditions causing mobility impairment
- Frailty
- Osteoarthritis
- Pain
- Polypharmacy

Rehabilitation
- To restore functional loss
- Mobility aids

Assess & Manage social and physical environment
- ADL and caregiving needs, including assistive devices
- Fall risk assessment & intervention (intrinsic and extrinsic factors)*

*Including home visit to identify hazards and create safer environment

Pathways for specialist referrals
e.g. complex pain, neurodegenerative disorder

Monitoring of care plan
Multi-disciplinary meetings with all stakeholders

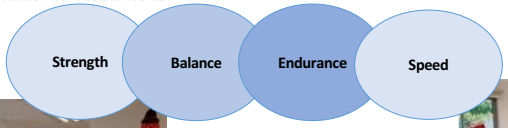
Normal Mobility
SPPB score 10-12

- Multimodal Exercises – home or centre based
- Behavioural nudges to support self-management

Locomotion Domain: Multi-modal Exercise Programme

Seniors doing sit-to-stands or sit-to-stands with resistance as they progress through the weeks.

- Progressive intensity through number of reps, increased resistance of Therabands, height of step-boards
- Individualized to frailty status and capability



Seniors working on side-walking in a group.

Seniors engaging in backward walking with obstacles in Week 6.

Vitality Domain: Nutritional Intervention

Seniors in a nutrition class. The nutritionist teaches them about the content in food products and recommends healthy choices.

Aim to facilitate healthy eating habits for adequate protein, energy and Vitamin D through regular food and beverages specific to Asian palate

Avoid use of supplements

Seniors during a Supermarket tour; seafood section for protein content

Nutritionist quizzing the seniors on product content.

Supporting Vitality (Nutrition) Domain through Interactive Education

Eat Well Age Well

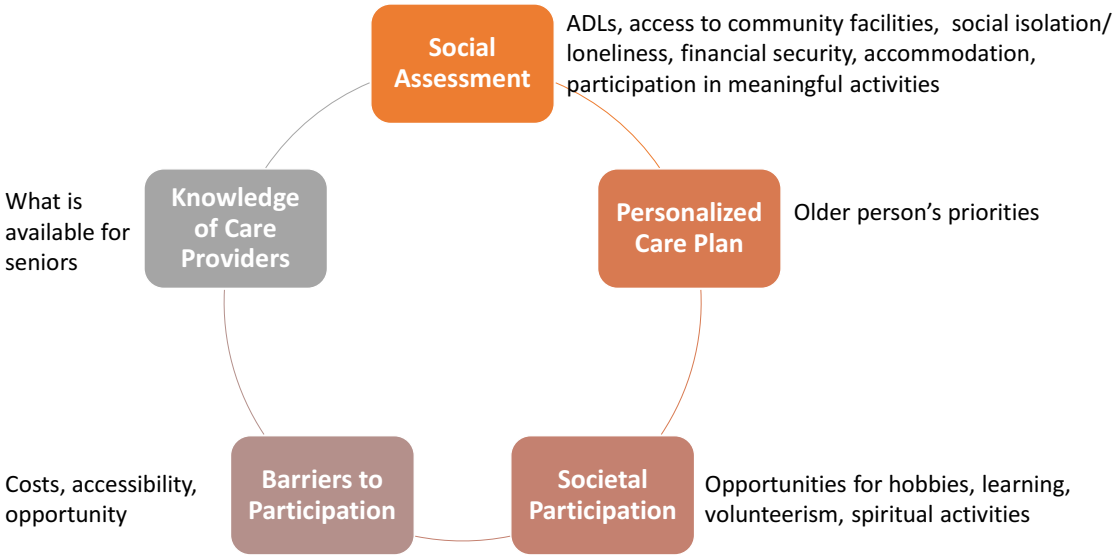
NUTRITION PROGRAMME OUTLINE FOR SENIOR CITIZEN	
Module 1	How to eat adequate protein for strong muscles?
Module 2	How do I get enough calcium for strong bones?
Module 3	How to eat smart & age well?
Module 4	How to shop smart?

If you have any health conditions, please follow the dietary advice by your dietitian/ doctor

Snippet of Virtual Supermarket Tour

SOCIAL CARE AND SUPPORT – KEY INFRASTUCTURE

- Goal of ICOPE : to help older people do things that are important to them
- Understanding the older person's life, priorities, and preferences



INTEGRATING HEALTH AND SOCIAL SYSTEMS TO SUPPORT ICOPE

- Optimizing IC, frailty prevention and supporting functional abilities of older people should begin in the community
- Need for strong case management to support design, coordination, and monitoring of care plans that span multiple health and social domains → need for training of health and social care workers
- Clear referral criteria and pathways – network at the secondary and tertiary level to support primary and community care

Aligned to Action Plan for Successful Ageing 2023

INFINITY-ICOPE PHASES: Guided by Implementation Research Logic Model

12-months	12-months	30-months	6-months
Phase 1 (POC)	**Phase 2 (POV)**	**Phase 3 (Test-bed)**	**Phase 4 (Scale-Up)**
• Readying technology • Readying communities • Developing care pathways	• Pilot on 60 seniors • Validate technology-enabled stratification against CGA	• Wait-listed cluster RCT of 540 seniors • 6-monthly follow-up over 1-year • Clinical, implementation effectiveness	• Sustainability of health outcomes • Scaling INFINITY-ICOPE across SingHealth/ national • Policy update
✓ IPPT-S platform to validate SCREENii ✓ mHealth App to support self-assessment and behaviour nudges ✓ ICOPE training in collaboration with SUSS	○ Pre- and post-surveys of seniors, community and primary care providers ○ Ensure individual care pathways accessible ○ Target at least 70% adherence to 6-month self-monitor		

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THANK YOU

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