

WHO Clinical Consortium on *Healthy Ageing*

Topic focus: frailty and intrinsic capacity

Report of consortium meeting 1–2 December 2016 in Geneva, Switzerland.



World Health
Organization

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Contents

Acknowledgements	iv
Abbreviations	v
Executive summary	vii
1. Introduction	1
2. Intrinsic capacity	3
Reframing the public health response to population ageing	3
WHO’s commitment on <i>Healthy Ageing</i>	4
One goal with countless public health benefits	4
Heterogeneity – a hallmark of intrinsic capacity	5
Clinical utility of the intrinsic capacity concept	6
Key conclusions and next steps	7
3. Frailty	9
The holy grail of geriatric medicine	9
Biological mechanisms underpinning frailty.....	9
Frailty interventions	11
Approaches to care for frail older people.....	11
Key conclusions and next steps.....	11
4. How to reorientate health services to provide integrated care for older people	13
Key discussion points and next steps	14
5. General discussion	15
6. Conclusions	17
References	18
Annex 1: List of participants	19
Annex 2: Agenda	21

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Abbreviations

ADLs	activities of daily living
FA	functional ability
FI	frailty index
FP	frailty phenotype
GP	general practitioner
IC	intrinsic capacity
ICOPE	integrated care for older people
WHO	World Health Organization

Executive summary

- This report summarizes the key points discussed during the World Health Organization (WHO) meeting of the Clinical Consortium on *Healthy Ageing*, held 1–2 December 2016 in Geneva, Switzerland.
- The intended audience for this report includes experts working in the field of ageing and frailty, WHO staff and other relevant stakeholders.
- The chair of the first day of the meeting was Bruno Vellas and the co-chair was John Beard. The chair on the second day of the meeting was Jean-Yves Reginster and the co-chair was Islene Araujo de Carvalho.
- The meeting was supported by WHO, the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO), and the Global Aging Research Network (GARN; established by the International Association of Gerontology and Geriatrics).
- The objectives of the meeting were to:
 - build on expertise in the field of frailty to further develop the WHO concept of intrinsic capacity (IC) so that it can be utilized in clinical settings, including prevention and health-promotion programmes;
 - understand the implications of the new WHO public health framework for *Healthy Ageing* for future work in the field of frailty; and
 - use the concepts of IC and frailty to inform the development of a model for integrated care for older people (ICOPE).
- for action to foster *Healthy Ageing* through the shared goal of maximizing functional ability (FA).
- WHO is committed to educating policy-makers and health care professionals about *Healthy Ageing* and IC. WHO is calling for health care professionals and policy-makers to look beyond disease states and move towards a holistic methodology in which the main goals become the prevention of declines in IC and the maintenance of FA.
- IC is the composite of all the physical and mental capacities that an individual can draw on at any point in their life. FA comprises the health-related attributes that enable people to be, and to do, what they have reason to value. It is made up of the IC of the individual, the relevant environmental characteristics, and the interactions between the two.
- The WHO *Healthy Ageing* model proposes that IC peaks in early adulthood and tends to decline from midlife onwards. There is great variability in these trajectories and some components of capacity may remain stable or even increase over the life course. Moreover, at an individual level, while trajectories are continuous, they are rarely smooth.
- A hallmark of ageing is the exceptionally wide diversity of IC observed across older people: there is no typical older person. Predicting an individual's IC for a specific age is therefore very challenging.
- Although IC trajectories can vary considerably between individuals, most people experience significant losses in IC towards the end of their life.
- Public health interventions can improve IC at almost all time points in a person's life.
- Prevention of disease, for example, in people with a high IC can help them maintain this IC. Adoption of a healthier lifestyle (such as through physical exercise and good nutrition) can positively modify the trajectory of the IC in later life.
- Understanding the reciprocal relationship between an individual's IC and their environment is important, particularly when older people experience significant loss of capacity. The environments inhabited by an individual can

Intrinsic capacity

- The WHO *Global strategy and action plan on ageing and health* was endorsed in 2016 by all of the Member States, thus providing a political mandate for action to achieve its aims. The vision is to achieve a world where everyone can live a long and healthy life. Ensuring that older people have equitable access to health care and other support mechanisms is essential to ensure *Healthy Ageing* for all. WHO identified many entry points

influence whether they build or maintain their IC, and can also help them to compensate for losses in capacity. Accessible transport for older people who have limitations to physical capacity, for example, can help them to get to where they need to go, including health care facilities. The FA for any given level of IC will thereby be determined by the dynamic interactions between a person's IC and their lived environment plus the resources available to them.

- Health care systems in many countries are not organized to maintain people's IC over their lifetimes but to identify and treat acute episodes of illness. Changing the focus of health care from an emphasis on acute conditions to one on promoting integrated care that results in *Healthy Ageing* and ICOPE will require a considerable shift in attitude and organization, as well as financial and human resources. An integrated approach to health across the life course will be essential, however, and to achieve this aim, specialist geriatric knowledge will need to be extended to general practice and community care.
- WHO has developed guidelines and tools on ICOPE (see <http://www.who.int/ageing/publications/guidelines-icope>). The aim of these is to encourage the creation of appropriate and comprehensive care plans that fulfil older people's goals. Global consultations with investigators, key funding agencies and other stakeholders will be undertaken to link the research to effective action.

Frailty

- Frailty is conceptually defined as a clinically recognizable state in which the ability of older people to cope with everyday or acute stressors is compromised by an increased vulnerability brought by age-associated declines in physiological reserve and function across multiple organ systems.

Intrinsic capacity (IC) and functional ability (FA)

WHO defines IC as the combination of the individual's physical and mental, including psychological, capacities; and FA as the combination and interaction of IC with the environment a person inhabits.

- Frailty is characterized by multisystem dysregulations, leading to a loss of dynamic homeostasis, reduced physiological reserve and greater vulnerability to subsequent morbidity and mortality. This is often manifested by maladaptive response to stressors, leading to a vicious cycle that results in functional decline and other serious adverse health outcomes.
- The biological underpinnings of frailty are multifactorial, involving dysregulation across many physiological systems. Frequent components of the biological substratum underlying frailty include a pro-inflammatory state, sarcopenia, anaemia, relative deficiencies in anabolic hormones (androgens and growth hormone) and excessive exposure to catabolic ones (cortisol), insulin resistance, compromised or altered immune function, micronutrient deficiencies and oxidative stress.
- As people age, they move along a continuum that stretches from robustness at one end to frailty and care dependence at the other end. When deciding which interventions should be implemented at specific time points, it could be very useful to define threshold values that reflect the transition from one state to another, such as from robustness to frailty. An ongoing and holistic assessment of an older person's needs is required when developing and refining an effective individual care plan that will fulfil the person's own life goals.
- Active case finding of older people with frailty is essential for the reorientation of health services to these people's needs. For people who are at risk of frailty, too, existing health service delivery models need to be reorientated to facilitate the integration of social and health interventions.
- Proactive identification of older people in the community at risk of frailty provides opportunities to intervene and so prevent or delay functional decline.

Key concluding messages

- Everyone working with older people should understand the concept of IC and know that it is not a fixed entity: declines in an older person's IC can be identified and further progression delayed or stopped; effective interventions can also restore a person's IC.
- The consensus of the meeting was that health care professionals and researchers in geriatrics should move away from focusing on disease towards

focusing on *Healthy Ageing* – that is, maintaining and enhancing the IC and FA of older people.

- Enhancing IC is a way of preventing frailty, and presenting the idea of IC as part of the frailty model will allow the concept to be accepted more easily.
- WHO could contribute to the operationalization of IC and frailty by supporting the development of standardized and validated tools that could be used globally. These tools, based on valid clinical criteria, may be used to measure IC in order to detect or diagnose early declines as well as to detect frailty.
- Precise definitions of frailty are required for both clinical and research purposes. At present, it is difficult

to compare the results of different studies on frailty because different definitions of the condition are used.

- Population-based strategies to maximize and maintain IC over the life course and to prevent frailty should be evaluated. High-quality clinical research, particularly in low- and middle-income countries, is needed to understand the determinants of deteriorating IC and, thus, of deteriorating frailty.
- WHO would like to build partnerships and networks of investigators to develop innovative ways of caring for older people. The WHO Clinical Consortium on *Healthy Ageing* was established to focus on clinical research, and it will generate new evidence.

1. Introduction

The *Global strategy and action plan on ageing and health* provides a policy framework from the World Health Organization (WHO) for ensuring that societal responses to population ageing are aligned with the strategy's ambitious development agenda (1). It calls for action on aligning health systems to the needs of older populations, and articulates that a transformation is needed in the way that health systems are designed – to ensure affordable access to integrated services that are centred on the needs and rights of older people. Systems will need to respond to these diverse needs, including those of older people enjoying high and stable levels of intrinsic capacity (IC), of people in whom capacity is declining, and of those whose IC has fallen to a point that requires the care and support of others.

WHO convened a meeting of the Clinical Consortium on *Healthy Ageing*, 1–2 December 2016, to:

- build on expertise in the field of frailty to further develop the WHO concept of IC so that it can be used in clinical settings, including in prevention and health-promotion programmes;
- understand the implications of the new WHO model of *Healthy Ageing* for future work in the field of frailty; and
- use the concepts of IC and frailty to develop and define a model for integrated care for older people (ICOPE).

The chair of the first day of the meeting was Bruno Vellas and the co-chair was John Beard. The chair on the second day of the meeting was Jean-Yves Reginster and the co-chair was Islene Araujo de Carvalho.

(See Annex 1 for more information on the chair people.) The meeting was supported by the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO) and the Global Aging Research Network (GARN; established by the International Association of Gerontology and Geriatrics).

The agenda for the meeting can be found in Annex 2, with information on the structure of both days and the speakers' presentation titles. The sessions covered the following themes:

- the WHO concept of *Healthy Ageing* and its implications;
- building and maintaining IC in the second half of life;
- experiences, challenges and lessons learnt in relation to frailty;
- operationalization of IC in primary health care settings; and
- approaches to prevent loss of IC.

There were 34 meeting participants: 26 clinical and academic experts in frailty, 6 WHO staff and 2 medical writers (see Annex 1 for a list of names and affiliations).

This report focuses on information that was presented on IC and frailty, as well as key points from the discussions about these topics.

Presentations are available alongside this full report at <http://www.who.int/ageing/health-systems/clinical-consortium-meeting/en/index1.html>.

2. Intrinsic capacity

Reframing the public health response to population ageing

The new vision of the World Health Organization (WHO) for ageing was articulated in 2015 in the *World report on ageing and health (2)*. This moved the organization from thinking about health in older age as the presence or absence of disease, and encouraged us instead to look more at an older person’s functional ability (FA). It also strongly endorsed the need for countries not only to cater more effectively for the needs of older people but also to provide their health services and care in a more integrated way.

In framing a public health response to population ageing (Fig. 1), WHO identified many entry points for action that could foster *Healthy Ageing* through a shared goal of maximizing FA. This goal can be achieved in two ways: through building and maintaining intrinsic capacity (IC), and by enabling someone with a given level of IC to engage in the activities that matter to them. In doing this, the public

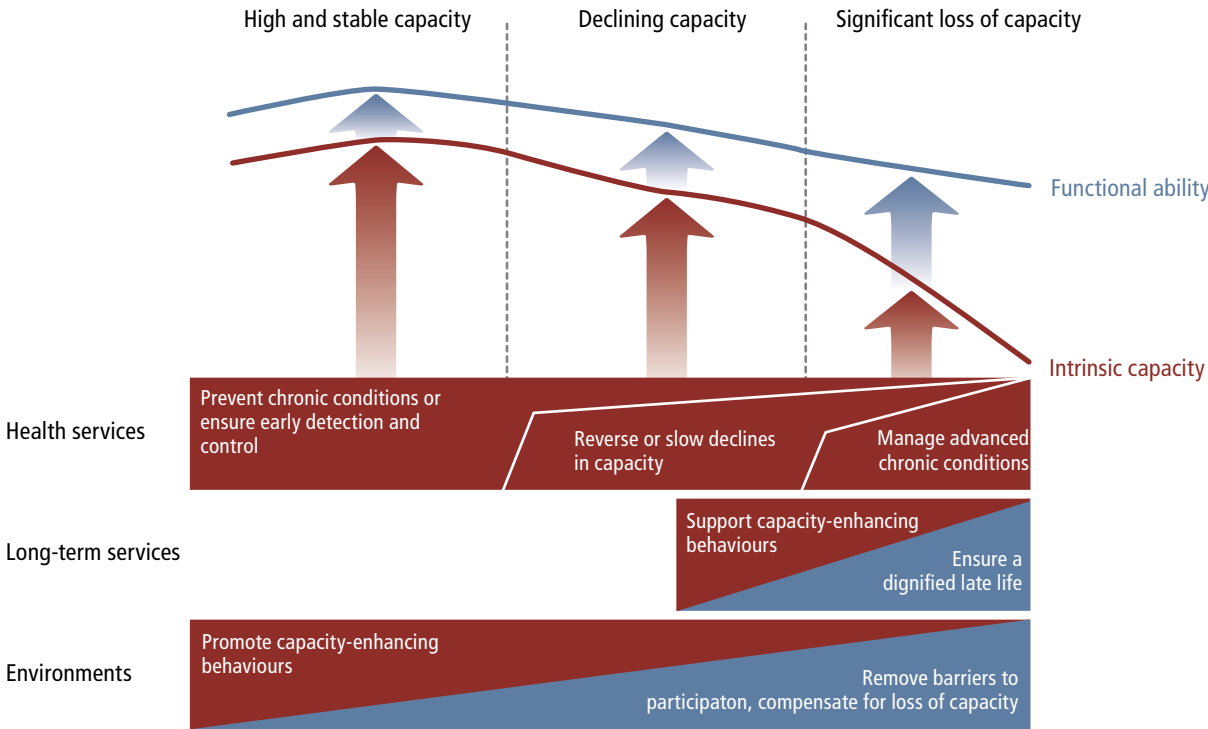
response will not only ameliorate the losses associated with older age but also reinforce resilience and psychosocial growth. Enabling older people to live in a meaningful and dignified way fosters their autonomy and enhances their quality of life.

At a population level, there is pressing need to optimize strategies that aim to raise overall levels of FA and address its unequal distribution, by paying particular attention to improving conditions for people in lower socioeconomic strata.

The public health framework identifies three subpopulations of older people: those with relatively high and stable capacity, those with decreasing capacity and those who have experienced substantial IC losses. These subgroups are not rigid, and nor do they describe the course of every older person’s life. If the needs of these subgroups are addressed, however, the FA of most older people will be enhanced.

WHO proposes priority areas for effective global actions that can help to achieve this aim. First, health

Fig. 1: Public health framework for Healthy Ageing



Source: WHO, 2015 (2)

systems need to be aligned to the older populations they now serve. Health care that addresses the multidimensional demands of older age in an integrated way is more effective than services that merely react to specific diseases independently. Older people often encounter services that were designed to cure acute diseases or symptoms, that manage health issues in disconnected and fragmented ways and that lack coordination across care providers, settings and time. This situation results in health care and other services that not only fail to meet the needs of older people, but that can also have great costs both to them and to the health system.

Achievement of the goal of *Healthy Ageing* is therefore not merely a case of doing more of what is already being done. Indeed, there is greater need than ever to reinvigorate outmoded health systems and national programmes for older people in all countries.

Intrinsic capacity (IC) and functional ability (FA)

WHO defines IC as the combination of the individual's physical and mental, including psychological, capacities; and FA as the combination and interaction of IC with the environment a person inhabits.

WHO's commitment on *Healthy Ageing*

WHO is committed to educating policy-makers and health care professionals about *Healthy Ageing* and IC. WHO is calling for health care professionals and policy-makers to look beyond disease states and move towards a holistic methodology in which the prevention of disease and the maintenance of functionality become the main goals. Equitable access to effective interventions should be ensured globally.

The WHO public health framework for global action has been endorsed by all of the Member States, thus providing an international mandate for action to achieve its aims (2). The vision is to achieve a world where everyone can live a long and healthy life. By 2020, the evidence base and partnerships needed to support the decade of *Healthy Ageing* (2020–2030) will have been established.

Ten priorities have been identified as essential for the success of the decade of *Healthy Ageing* (see <http://www.who.int/ageing/10-priorities>).

1. Establish a platform for innovation and change.
2. Support country planning and action.
3. Collect better global data on *Healthy Ageing*.
4. Promote research that addresses the current and future needs of older people.
5. Align health systems to the needs of older people.
6. Lay the foundations for a long-term-care system in every country.
7. Ensure the human resources necessary for integrated care.
8. Undertake a global campaign to combat ageism.
9. Define the economic case for investment.
10. Enhance the global network for age-friendly cities and communities.

There is a globally unmet need for a greater number of specialists in the care of older people and for more research in the field to develop a body of evidence that will support best practice. WHO is supporting research and developing tools for ICOPE. Global consultations with investigators, key funding agencies and other stakeholders will be needed to link research to effective actions. A working group that focuses on clinical research will be set up under the auspices of the Clinical Consortium on *Healthy Ageing*.

One goal with countless public health benefits

In 2015, WHO introduced the new concept of IC. This concept encompasses a multitude of health characteristics as well as underlying physiological and psychosocial changes associated with ageing (2). IC is defined as the composite of all the physical and mental, including psychosocial, capacities that an individual can draw on at any point in time. In general, IC declines from a high and stable state to an impaired status as people age. Towards the end of their lives, most people experience significant losses in IC. Individual IC trajectories can vary considerably and the population diversity of IC has been shown to increase with age (Fig. 2); predicting the IC that an individual will have at a specific age is therefore challenging.

It is possible, however, to intervene to increase IC at almost any time point in a person's life. Preventing disease

in people with high IC, for example, can help to maintain their level. Potential disorders and geriatric syndromes in people with declining IC should be investigated so that they can be treated appropriately and IC regained. Understanding the reciprocal relationship between an individual's IC and their environment is important, particularly when older people experience significant loss of capacity. Environmental adaptations can be introduced to compensate for losses in IC, such as providing transport for physically impaired older people to facilitate their access to care. The dynamic interactions between a person's IC and the environment they live in, plus the resources they are able to utilize, will thus determine the FA of an individual.

Heterogeneity – a hallmark of intrinsic capacity

The WHO *Healthy Ageing* model proposes that IC peaks in early adulthood and tends to decline from midlife onwards. There is great variability in these trajectories and some components of capacity may remain stable or even increase over the life course. Moreover, at an individual level, while trajectories are continuous, they are rarely smooth. Although IC tends to fall with age, there are some exceptional individuals aged 80 years and over who have maintained an IC that is higher than the mean level seen in younger adults, while others may present a very low level of IC in their later years that has been held since earlier years in the trajectory. These trends highlight the diversity that is a hallmark of older age and that counters the stereotype that there is such a thing as a typical older person.

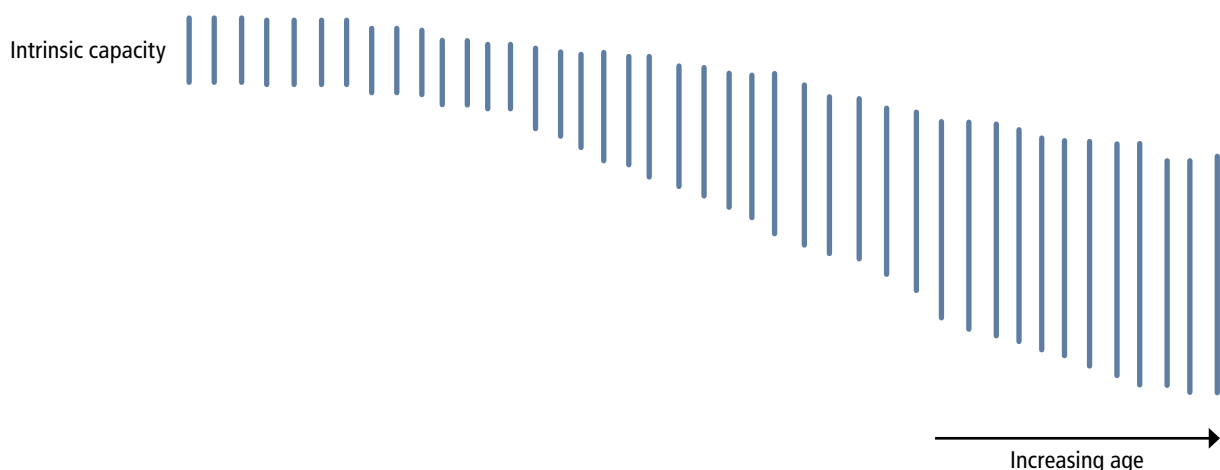
This heterogeneity of IC observed across the life course is not random. Differential access to resources affects a person's ability to retain physical and mental capacities as they age. In the Australian Longitudinal Study on Women's Health, women with higher incomes maintained greater levels of physical capacity as they aged compared with women with lower incomes (3). People with the greatest health needs may have the least resources to meet them. Good health literacy throughout a person's lifetime contributes to *Healthy Ageing*. Population-based strategies to maximize and maintain IC over the life course should be evaluated and cost-effective strategies implemented.

FA can likewise alter over time: an older person with moderate-to-good function may experience a decline in IC due to a fall, respiratory tract infection or mental health condition, resulting in a reduction of FA. Recovery from transitory losses of IC enable the person to return to a moderate-to-good FA. Oscillations in function take their toll on the older person, leading to a stepwise deterioration in their condition as they lose reserves of capacity and move towards a pre-frail and then a frail state of health. Assessments of older people should be made regularly, even though it is challenging objectively to measure a person's FA and reserves.

Clinical utility of the intrinsic capacity concept

Introducing the IC concept into clinical practice will shift the focus from a person's disease to a person's capacity; and from diagnosing a disease at a specific time point to monitoring the trajectory of a person's health and

Fig. 2: The diversity of IC increases with age



capacity across the entire life course. Unfortunately, health care systems in many countries are not organized to maintain people's IC over their lifetimes but to identify and treat acute episodes of illness.

Geriatric specialists have traditionally worked with frail older people at stages characterized by significant losses of IC. As people live longer, it is important to preserve FA in those older people whose IC is declining but for whom living in the community is possible with some support. It may be a more efficient use of resources if health professionals start to focus on preventing catastrophic reductions in IC in this group of older people.

High- and middle-income countries are facing a new epidemiological challenge: chronic noncommunicable diseases are developing at an earlier stage in life than for previous generations. Since people often experience multiple noncommunicable diseases at the same time (e.g. obesity, diabetes and hypertension), multimorbidity may result in people losing IC and becoming frail at an earlier age than would have been expected previously. For example, African Americans aged 50–65 years attending a clinic for diabetes have been shown to exhibit signs of frailty (4). Responding to these changes in epidemiology will require the generalization of specialist geriatric knowledge to general practice in order to scale up interventions in the community for people who are not presently considered to be older patients. An integrated primary care approach to whole-life-course medicine will be essential to shifting the focus from curing disease to optimizing a person's IC across their life.

In this model, interventions are person-centred and part of providing integrated care. They are delivered by a multidisciplinary team in the community within a primary health care setting. In low- and middle-income countries, community-based health care workers and volunteers could be trained to monitor older people using a similar approach to that followed by maternal and child health care workers. In high-income countries, self-operated computerized systems can carry out routine tests, thus minimizing the need for human resources. Good algorithms are needed to analyse health metadata from these systems, as well as from smartphones and wearable devices, so that the interpretation of the information is as simple as possible and can be used to advise people about how to enhance IC and FA. The reliability and accuracy of data obtained from these devices must be evaluated. Screening should be throughout a person's life. There is a need to address the ethical implications of

advising people that their physical or mental capacities are declining at a greater rate than normal. The issue of which organization(s) are entrusted to take care of personal health data also needs to be addressed.

Individuals should be encouraged to take responsibility for maintaining their health into older age. Active self-management of health – such as by eating healthily, doing regular exercise and maintaining adequate intakes of vitamin D and proteins – will require education at a population level. Primary health care should focus on helping people to prevent IC declining in both the physical and psychosocial aspects of life. The tools used would have to be validated, and sensitive enough to detect changes in IC over time.

Older people often complain of declining energy levels, even in the absence of a clinically overt disease. This can be an important marker of declining IC and the loss of reserves or robustness. As well as the more subjective information, such as mood, it is important to collect objective data for an accurate assessment of an older person's physical and mental capacities. Goals can then be set by – and/or for – the older person for maximizing their IC. This approach will also place greater importance on the person's values when defining the interventions to put in place.

Person-centred care should be implemented. The gathering and analysis of personalized metadata is becoming more feasible thanks to wearable devices and cloud-based data sharing. Clinicians will be able to use this information to assess a person's health. Predictive, preventive, personalized and participatory (P4) medicine could become more proactive by focusing on IC and FA. The principles of tools already in use to monitor infants and children, such as children's growth charts, could be adapted to monitor older people. Early indicators of declining IC could be identified in this way, and interventions implemented to maintain IC and FA. Factors that it might be useful to monitor are strength, sensory functions, cardiovascular function, metabolic measures (body mass index, cholesterol levels, etc.), inflammatory markers (e.g. C-reactive protein), cognition and locomotion.

Key conclusions and next steps

- The consensus at the meeting was that geriatrics should move away from a focus on disease towards maintaining and enhancing the IC and FA of older people.

- Enhancing IC is a way of preventing frailty. It was agreed that the idea of IC will be accepted more easily if it is presented as part of the frailty model.
- Everyone working with older people should understand the concept of IC and know that it is not a fixed entity: an older person's IC can often be restored after recovery from physical or mental insults.
- The gathering and analysis of personalized metadata is feasible thanks to wearable devices and cloud-based data sharing. Clinicians will benefit from this information when assessing a person's health and monitoring their IC trajectories across the life course.
- Responding to changes in population health profiles will require a scaling up of interventions designed for delivery in community settings to people who are not presently considered to be older patients. Such scalability requires the dissemination of specialist geriatric knowledge and a shifting of some care responsibilities to general practitioners and other healthcare professionals in community settings. An integrated primary care approach to whole-life-course medicine will be essential in shifting the focus from curing disease to optimizing a person's IC across their life span.
- A powerful motivator for behavioural change could lie in communicating the idea of a person's IC – rather than focusing on their chronological age – and encouraging people to strive towards maintaining their optimal IC by protecting their health.
- Population-based, cost-effective strategies to maximize and maintain IC over the life course should be investigated in future research.

3. Frailty

The holy grail of geriatric medicine

In recent years, the identification of older individuals who are frail or at risk of becoming frail and who need appropriate evaluation and intervention(s) has become a cornerstone of geriatric care. While health care providers and researchers in the field of ageing have long been aware of the term “frailty”, defining this syndrome and operationalizing the concept for non-specialized health settings has proven to be elusive. Despite the lack of consensus on an operational definition of frailty, impressive progress has been made over the last two decades, and the number of scientific publications on this topic – particularly reports of data from randomized controlled trials – has grown enormously. International efforts have also been made to reach a consensus on the definition but, disappointingly, so far without success.

Frailty may be conceptually defined as a clinically recognizable state in older people who have increased vulnerability, resulting from age-associated declines in physiological reserve and function across multiple organ systems, such that the ability to cope with everyday or acute stressors is compromised. Based on this conceptual framework, two major definitions with proposed assessment tools have emerged over the past decade: the frailty phenotype (FP) also known as Fried et al.’s definition, and the frailty index (FI).

In a landmark study, Fried et al. undertook a secondary analysis of data obtained from a prospective cohort study (the Cardiovascular Health Study) of 5210 men and women aged 65 years and older (5). They operationalized a frailty syndrome when three or more of the following five phenotypic criteria were present:

1. weakness measured by low grip strength
2. slowness measured by decreased walking speed
3. low level of physical activity
4. low energy or self-reported exhaustion
5. unintentional weight loss.

A pre-frail stage was also proposed, in which one or two criteria were present. This second construct is aimed at identifying a subset of older adults at high risk of progressing to frailty. Older individuals with none of the above five criteria were classified as robust. This

definition recognizes frailty as a discrete clinical entity that is distinct from disability (which is defined by impairment in activities of daily living, ADLs) and comorbidity (which is the presence of two or more chronic diseases). An overlapping of these three entities is, though, possible. Several cross-sectional and longitudinal studies have examined the public health utility of this construct. A growing body of evidence suggests that the FP has considerable cross-cultural validity and a high predictive value to inform the prevention of adverse outcomes in older populations, in both clinical and community settings.

The FI on the other hand, proposed by Mitnitski et al., follows a different approach (6). It is based on an arithmetical assumption, and measures frailty in terms of an age-related accumulation of “deficits”. The FI is computed as the ratio between the deficits (namely the signs, symptoms, diseases and impairments) a person presents and the number of deficits considered after a comprehensive clinical evaluation. The resulting score (ranging from 0 for an absence of deficits, to 1 for a presence of all) may represent a marker of biological ageing. Studies have shown the consistency and robustness of this construct, as demonstrated by its:

- predictive capacity for negative health-related outcomes in the community and different clinical settings; and
- applicability and validity across species for the study of the ageing phenomenon.

Biological mechanisms underpinning frailty

Frailty is characterized by multisystem dysregulations, leading to a loss of dynamic homeostasis and physiological reserve and an increased vulnerability for subsequent morbidity and mortality. This is often manifested by maladaptive responses to stressors, leading to a vicious cycle of functional decline and other serious adverse health outcomes.

It has been suggested that the biological basis of frailty is multifactorial, involving dysregulation across many physiological systems (7). Additional findings show that the risk of frailty increases in a nonlinear pattern with the number of deficits and dysregulated physiological

systems, independently of chronic diseases and chronologic age. This suggests synergistic effects among individual abnormalities that, on their own, may be relatively mild. The clinical implication of this is that interventions that affect multiple systems may yield greater, synergistic benefits in the prevention and treatment of frailty than interventions that affect only one system – if interventions are given in a comprehensive and integrated fashion.

In 1998, Fried and Walston defined frailty as a vicious cycle of energy dysregulation, and proposed the cycle of frailty (Fig. 3) (8). This describes pairwise relationships between various factors that contribute to the downward path to the frail state, many of which interact with each other. It is hypothesized that this clinical presentation is a result of dysregulated energetics and the synergistic malfunction of physiological systems increasing the risk of frailty.

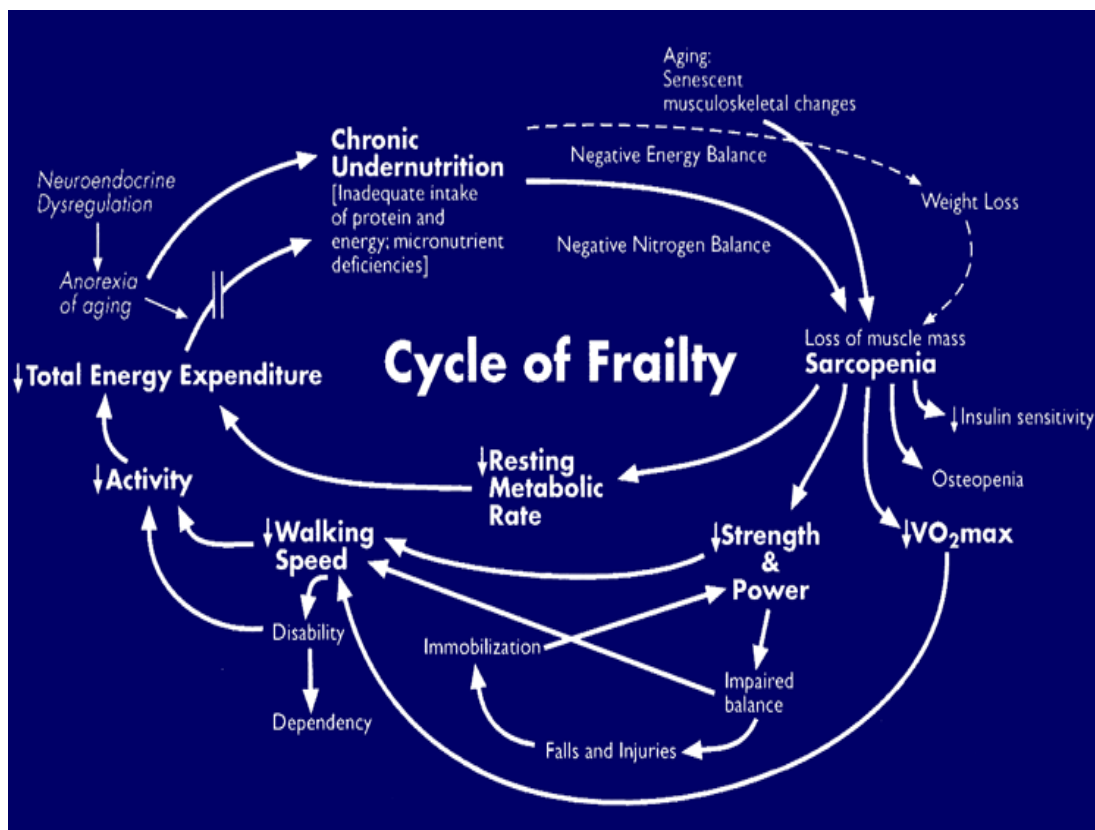
Ageing itself is thought to be associated with progressive homeostatic dysregulation of the complex system. The theory proposes that this results both from decreased function in multiple physiological systems and

loss of layers of feedforward and feedback mechanisms among interacting systems. This could result in a compromise of the homeostatic physiological safety net essential for the maintenance of reserves and resilience.

Does the risk of frailty rise with the number of abnormal systems, over and above any risk associated with one specific system that is functioning abnormally? If it does, this would provide an insight into the etiology of frailty and thus its treatment and prevention. One research study has examined the hypothesis proposed by the cycle-of-frailty theoretical model (9). This study found – with both frailty models consistently – that three or more systems exhibiting abnormal levels of functioning constituted significant predictors of frailty, and that the dominating predictor was the number of abnormal systems rather than the existence of one particular system abnormality.

This aggregated phenotype of frailty is consistent with the definition of a syndrome (10). It has been validated in multiple studies and has been shown to predict outcomes better than using only one or two markers (5). The non-linear relationship between the number of

Fig. 3: The cycle of frailty



Source: Fried and Walston (8); adapted with permission. VO₂max: maximal oxygen consumption

abnormal systems and the occurrence of frailty suggests that frailty can be considered the dysregulation of a non-linear, complex, adaptive set of systems that together normally maintain a resilient and robust human organism. These findings – although from a cross-sectional study, so without an ability to prove causality – strongly suggest that when physiological dysregulations reach an aggregate critical mass, frailty becomes clinically evident. Also, interventions stemming from a comprehensive evaluation of the individual and directed at enhancing their biological reserves may prevent a worsening of health status.

Frailty interventions

Sarcopenia – age-associated loss in muscle mass and function – is a key component of frailty. Several studies are investigating physiological and clinical aspects of the condition. Behavioural interventions to preserve and enhance muscle mass and function are needed to prevent sarcopenia and frailty.

The phase III randomized controlled trial, LIFE (Lifestyle Interventions and Independence for Elders), compared aerobic plus resistance exercise with health education in 1635 older people across eight clinical centres in the United States of America (11). Providing 24 months of a structured programme of moderate-intensity physical activity significantly reduced the risk of major mobility disability. It is particularly noteworthy that the largest effect size from the physical exercise intervention was reported among the participants with more severe frailty states – in the subgroup with a lower physical function at baseline against the Short Physical Performance Battery. Evidence also exists to show positive effects of exercise on cognitive capacity (especially executive function) and bone metabolism.

There are complex relationships between the disablement pathway, IC, frailty and sarcopenia. Diminished IC results in impairments in FA and, eventually, difficulties with ADLs. Interventions should be targeted against the causes underlying frailty rather than its clinical manifestations in order to prevent or reverse frailty.

Approaches to care for frail older people

Many older people and their caregivers are often not proactive about maintaining health. The following is a common pattern: a frail older person living in the community is admitted to the emergency room due to a fall or other health problem, and is then transferred to a

geriatrics department for subsequent diagnostic services and care. The hospital stay often results in further functional impairment that is not solved prior to release. When discharge to the home is not possible because of clinical or social issues, the person is institutionalized and becomes care dependent.

Active case finding of older people in states of frailty is essential for reorientating health services to these people's needs. Frail individuals can be identified via simple, validated screening questionnaires administered by health or social care professionals, via outreach programmes, by follow-up after calls to the emergency services, and as part of retirement health insurance packages. In this context, the training of physicians, health care workers and policy-makers about the impact and management of frailty is essential. Barriers that prevent older people from accessing health care services must be removed, such as by ensuring that health care facilities are accessible, providing well trained and empathetic staff, and fostering a positive attitude towards the care of frail older people. The provision of evidence-based interventions to prevent frailty should help to reduce the care burden of frail older people. A frailty clinic has been set up in Toulouse, France, to test these approaches, see Box 1.

Key conclusions and next steps

- There is an urgent need to develop a global consensus on an operational definition of frailty in order to advance the clinical care of older people and improve research into frailty. The World Health Organization (WHO) was urged to take the lead in these efforts.
- High-quality research, particularly in low- and middle-income countries, is needed to understand the determinants of frailty and to develop cost-effective interventions that can be used in a range of settings.
- Existing health service delivery models need to be reorientated to facilitate the integration of social and health care interventions for people who are at risk of frailty.
- Proactive identification of frail older people in the community could provide opportunities to intervene and prevent or delay functional loss, although evidence remains lacking.
- The comprehensive geriatric assessment is the current evidence-based method to detect, evaluate

and support the management of frailty. This is a resource-intensive process, however. There is therefore a pressing need to identify reliable and

efficient assessment methods for use in routine primary care.

Box 1: Toulouse experience on frailty: active case finding and referral¹²

Many older people fear becoming frail and are interested in ways to improve their health. In Toulouse, patients are referred by general practitioners (GPs) after they have been screened with a simple frailty-assessment tool in the community. Screening also occurs after an emergency has occurred (e.g. admission to the emergency room) and as a routine part of retirement insurance coverage when the person requests assistance. Each assessment session costs €500 and takes 1.5 hours. Health care professionals are encouraged to perform subjective assessments of the frailty of older people at every clinic visit. After an intensive educational effort, GPs have become committed to the frailty project, and

awareness of the condition has increased among health care professionals and policy-makers. One simple way to describe frailty is “the condition that precedes care dependency”. The frailty project has been extended to 20 GP offices. One nurse practitioner visits each office for half a day once a month. Older people have been unwilling to attend a hospital clinic for an assessment but attending the GP clinic has been acceptable. Providing integrated health care for older people (ICOPE) in the GP’s office may be an additional benefit of the frailty screening project. The project follows the principles of predictive, preventive, personalized and participatory (P4) medicine.

4. How to reorientate health services to provide integrated care for older people

In the World Health Organization (WHO) approach to integrated care for older people (ICOPE), interventions are person-centred and provided in an integrated manner. Ideally, most interventions could be delivered in the community within a primary health care setting, by a multidisciplinary team or by a community health worker.

Fig. 4 illustrates a theoretical model that could be used to monitor, maintain and maximize intrinsic capacity (IC) in an integrated care approach. Comprehensive IC monitoring in combination with clinical assessments would be used to create a health care plan.

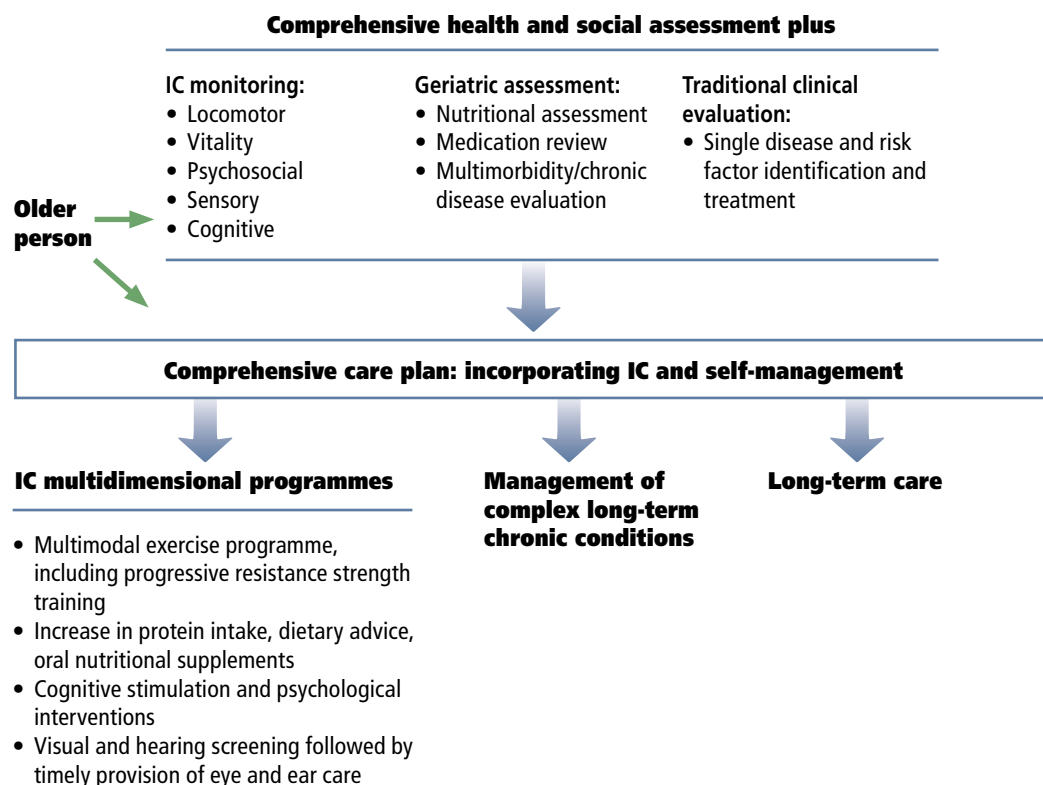
The key for maintaining IC is that everyone can have access to “comprehensive health assessment plus”. This includes the assessment of IC and the identification of associated underlying causes/diseases plus the assessment of social care and support needs. These factors will inform a comprehensive care plan that is aimed at delivering

multidimensional interventions to prevent or maintain IC, at managing and treating underlying diseases and at addressing long-term care and support needs.

The care plan therefore has several components for the management of changes in the trajectory of IC, including interventions to prevent, slow or stop declines in IC. The plan is supported by treatments of specific conditions and, where needed, support to compensate for functional losses. The end goal is to maintain IC, not to cure specific diseases.

Strategies to implement these principles can be many and will depend on the available human resources and the level of the development of national health systems. In some countries, monitoring of IC can be undertaken daily through self-management approaches and with the help of mobile device technologies. In other settings, community-based strategies that combine screening and incidental case finding could be a more feasible way of

Fig. 4: How to monitor, maintain and maximize IC



Source: Islene Araujo de Carvalho, Department of Ageing and Life Course, WHO

monitoring trajectories of IC and identifying those people most in need of care.

Several issues must be addressed as follows to reorientate health services towards integrated care, especially in primary health care settings.

- Prioritize the prevention of functional loss and the maintenance of IC in older people.
- Create a better understanding of the trajectory of IC, especially the timing and rate of its decline, as well as its determinants.
- Determine if there are preclinical manifestations of problems with health or capacity that are linked to different sections of the trajectory. Identify the early markers of declining IC so that effective interventions can be designed to stop or delay the decline.
- Determine how to monitor and measure predictors of IC in younger (midlife) adults – new performance tests may be needed for this process.

Key discussion points and next steps

The meeting participants agreed that delivering integrated care required a multidisciplinary team that could collaborate closely. Proactive integration between health care and social care services is essential. Older people may enter the integrated care system either via health care or social care. Ideally, there should be one point of contact for the older person and their caregiver or family – a care coordinator, for example. The following key elements were identified.

- Community-level tools that can be used to assess the older person's IC and FA and to establish the person's goals should be developed and validated globally.
- Undertaking one standardized assessment of the older person's health, environment and FA is critical to the success of integrated care. All members of the care team should be able to access this information via information technology systems (applicable mainly in high-income countries) or via face-to-face meetings (applicable in high-, middle- and low-income countries). The aim should be to identify those older people whose IC is starting to decline so that targeted interventions to reverse this decline can be started.
- The time course and expected outcomes of interventions should be validated in a standard manner. It would be interesting to determine any dose–response relationships for specific interventions – if a certain time period and

frequency of exercise, for example, were needed to achieve a specific improvement in a person's FA.

- The cost of care and any barriers to accessing care should be evaluated. For example, health care workers often ignore complaints of tiredness and lack of sleep, even though they are indicators of a reduction in IC. If older people encounter negative attitudes or feel that their complaints are marginalized, they may disengage with health care services. Health and social care workers, especially in high-income countries, need to be trained so that they listen carefully to older people and respond appropriately to their problems. The focus of the curriculum should be shifted from a disease-centred approach to one of function-centred and integrated care. Call centres could be used to communicate efficiently and cost-effectively with older people or their caregivers about the availability of services and to deliver standardized advice.
- The economic and quality-of-life impact on the household and on the caregiver should be assessed in a range of settings where older people are cared for.
- There is a substantial need for further geriatric research. High-quality, globally relevant data from a range of settings, especially at the community level, are lacking. Information on the needs of older people worldwide as well as on the efficacy of interventions to meet these needs is required urgently.
- Advocacy for better services for older people is crucial to persuade policy-makers to allocate resources for ICOPE. Interest in this area is growing in many low- and middle-income countries as life expectancy increases. It may be easier to set up integrated care teams in these countries since there are fewer entrenched systems for the care of older people than in high-income countries. People working in high-income countries could learn from those in low- and middle-income ones about how to shift tasks for more efficient delivery of community-based, cost-effective care. Investing in older people can enable them to be an asset to the community rather than a drain on resources.
- Preventing social isolation at the community level can help older people to maintain their IC and FA. There is the potential for businesses to fulfil older people's needs for health and/or social care: many older people like to have a choice of supplier, and businesses are starting to appreciate the economic potential of an increasing number of older people worldwide.

5. General discussion

The attendees agreed that the World Health Organization (WHO) could contribute to the operationalization of IC and frailty by supporting the development of standardized and validated tools that could be used globally. Tools that are used to measure IC and to screen for frailty in older people must be based on biological and clinical criteria. The goal would be to use these tools to determine when interventions should be implemented and their effectiveness.

Creating a vocabulary and using standard terminology that is accurate and acceptable are important ways of ensuring high-quality communications to general populations about *Healthy Ageing*, IC and frailty. The use of positive terms such as “resilience” and “strength” conveys a better image of *Healthy Ageing* than the use of negative words such as “fragile” or “weakness”. A universally agreed framework of reference for ageing and ageing research would be very useful.

Precise definitions of IC and frailty are needed for both clinical and research purposes. It is difficult at present to compare the results of different studies on frailty because different definitions are used. WHO could take a lead role in developing and publicizing definitions, which can be updated as new data become available. It might be necessary to disentangle the concept of frailty from the tools used to measure it. WHO is already working to publicize the difference between the concepts of multimorbidity and frailty.

WHO could disseminate data on the costs of frailty to convince governments and insurance companies to invest in preventive measures, such as exercise and nutrition programmes.

Frailty can be viewed as both a treatable medical condition and a public health concern. Medical and

political decisions will have to be made about allocating resources to the management of frail older people, who need sustained clinical and social care. Primary health care should adopt the goal of keeping older people out of hospital, to maintain their quality of life at the same time as maintaining their health, and to reduce the risk of care dependency. Technology, such as remote monitoring and self-administered questionnaires, should be deployed to collect health data that can inform the efficient management of an older person’s health.

The concept of maintaining IC can be considered analogous to that of preventing or controlling noncommunicable diseases or conditions such as osteoporosis. WHO could play a role in promoting the concept of maintaining a person’s IC in order to improve health at both the individual and the population level. Lifestyle activities in the community can be designed to enhance older people’s IC. It might be easier to organize these interventions in low- and middle-income countries, which tend to have integrated primary health care systems, than in high-income countries, which are more likely to have specialized (so-called silo) health care systems. Global education campaigns are needed to motivate people to take care of their own health throughout life. It was suggested that a “Stop Frailty” campaign and/or a WHO test that would be able to assess IC could be game-changers in public health. These campaigns would appeal initially to the worried well, who would be motivated to follow the advice and to protect their IC; but it would be necessary – to effect changes at the population level – to reach out also to people who traditionally take little interest in their health or who are not exposed to health education.

6. Conclusions

Three major tasks were identified by the meeting:

1. to agree a common terminology to be used in research into the care of older people, especially for frailty and intrinsic capacity (IC), and their operational definitions in particular;
2. to develop standardized and validated tools to measure frailty and IC; and
3. to build a better evidence base to support the interventions used in a model of integrated care for older people (ICOPE) – the interventions should be validated in a range of settings across the world.

The World Health Organization (WHO) would like to build partnerships with and networks of researchers to develop innovative ways of caring for older people. One option would be to set up an overall consortium as well as working groups that focus on specific topics of *Healthy Ageing*. Background papers on issues identified in this meeting could be prepared before the next meeting of the WHO Clinical Consortium on *Healthy Ageing*.

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Annex 2: Agenda

Day 1

Frailty and intrinsic capacity: the way forward

Chair: Bruno Vellas

Co-chair: John Beard

Time	Agenda item	Speaker
09:00-09:30	Introductions, scope, objectives and expected outcomes of the meeting	Islene Araujo de Carvalho
Session 1: The WHO concept of <i>Healthy Ageing</i> and its implications		
09:30-09:50	Introduction of the new WHO conceptual framework for <i>Healthy Ageing</i>	John Beard
09:50-10:30	Plenary discussion/guided questions	
10:30-11:00	Coffee break	
Session 2: Building and maintaining intrinsic capacity in the second half of life		
11:00-11:15	Clinical utility of the concept of intrinsic capacity – an introduction	Islene Araujo de Carvalho
11:15-11:35	Intrinsic capacity constructs	John Beard
11:35-11:45	Questions and answers	
11:45-12:15	Biological theory for the construct of intrinsic capacity to be used in clinical settings	Matteo Cesari
12:15-13:30	Plenary discussion/guided questions	
13:30-14:30	Lunch break	
Session 3: Frailty: experiences, challenges and lessons learned		
14:30-14:45	History, development and lessons learned from the frailty concept	Linda Fried
14:45-15:00	Frailty conundrums: dilemmas and unsolved conceptual issues	Roger Fielding
15:00-15:30	Questions and answers	
15:30-16:00	Coffee break	
16:00-16:15	Why has frailty not being operationalized? As a disease/syndrome? As a health-promotion/prevention strategy?	Bruno Vellas
16:15-17:30	Plenary discussion and conclusions	

Day 2

Moving forward with integrated care

Chair: Jean-Yves Reginster
Co-chair: Islene Araujo de Carvalho

Time	Agenda item	Speaker
Session 3: Operationalization of intrinsic capacity in primary health care settings		
09:00-09:15	WHO ICOPE programme: an example of application of the intrinsic capacity concept in primary health care settings	Islene Araujo de Carvalho
09:15-09:30	New research findings	Cyrus Cooper
09:30-10:00	Plenary discussion	
10:00-10:30	Coffee break	
Session 4: The way forward		
10:30-10:45	Evidence base for clinical interventions to prevent declines in intrinsic capacity	Jotheeswaran Amuthavalli Thiyagarajan
10:45-11:00	Physical exercise protocol to improve physical capacity and address frailty	Mikel Izquierdo
11:00-11:15	Transforming the model of care for older person: positioning self-care	Enrique Vega
11:15-13:00	Building the norms, standards and tools to enable the operationalization of IC and frailty – future partnerships or networks	Plenary discussion
13:00-14:00	Lunch break	
14:00-15:00	Summary of discussions and the way forward	

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