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Aging, Functioning, and Rehabilitation

Ruth Cooper, Adrienne Formentos, and Allison Boman, *Rapporteurs*

Board on Global Health

Board on Health Care Services

Health and Medicine Division

Proceedings of a Workshop

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Reviewers

This proceedings of a workshop was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published proceedings as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the charge. The review comments and draft manuscript remain confidential to protect the integrity of the process.

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CANDACE GOH XIAO HUEY, Hospital Beaufort, Malaysia
MELISSA SELB, Swiss Paraplegic Research, Switzerland
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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the content of the proceedings nor did they see the final draft before its release. The review of this proceedings was overseen by **DAVID B. REUBEN,** University of California, Los Angeles, United States. He was responsible for making certain that an independent examination of this proceedings was carried out in accordance with standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the rapporteur and the National Academies. We also thank staff member Samantha Koretsky for reading and providing helpful comments on this manuscript.

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Contents

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

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Boxes and Figures

BOXES

FIGURES

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Acronyms and Abbreviations

CAT	computerized adaptive testing
ClinFIT	Clinical Functioning Information Tool
DALY	disability-adjusted life-year
FNAT	Functional Needs Assessment Tool
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
ICOPE	Integrated Care for Older People
LMIC	low- or middle-income country
NAM	National Academy of Medicine
OECD	Organisation for Economic Co-operation and Development
PAHO	Pan American Health Organization
UN	United Nations
WHO	World Health Organization

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Proceedings of a Workshop

WORKSHOP OVERVIEW[1]

With breakthroughs in medicine and technology and socioeconomic developments globally, people are living longer. The global population over age 60 is projected to reach 1.4 billion by 2030 (WHO, 2022a). Functioning, as a concept, constitutes a rethinking of health that goes beyond the medical model, which is focused almost exclusively on disease and disability (see section on foundational concepts for more information). Rehabilitation professionals are key in this transformative approach, particularly to provide care for and improve prevention for the aging population. A recent World Health Organization (WHO) statement has noted that the need for rehabilitation is increasing due to the epidemiological shift from communicable to noncommunicable diseases, and new rehabilitation needs are also emerging from infectious diseases such as COVID-19 (WHO, 2023a). Further, the need for rehabilitation is increasing due to rapid population aging worldwide accompanied by a rise in physical and mental health conditions, limitations, and injuries. The WHO statement emphasized that rehabilitation needs are largely unmet globally and that rehabilitation services are key to the achievement of the United Nations' Sustainable Development

[1] The planning committee's role was limited to planning the workshop, and the Proceedings of a Workshop has been prepared by the workshop rapporteurs as a factual summary of what occurred at the workshop. Statements, recommendations, and opinions expressed are those of individual presenters and participants and are not necessarily endorsed or verified by the National Academies of Sciences, Engineering, and Medicine, and they should not be construed as reflecting any group consensus.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Goal 3 (to ensure healthy lives and promote well-being for all at all ages).[2] It has been suggested that efforts are needed in identifying the economic challenges in operationalizing the concept of functioning as a measure for health policy, rethinking disability as a universal human experience, and formulating a feasible public health agenda that addresses the increasing relevance of rehabilitation for the twenty-first century (Cieza et al., 2019). A public health agenda that incorporates a new understanding of functioning and rehabilitation in the context of healthy aging could better address the health needs of older adults and facilitate this population's continued contribution to society

On February 16–17, 2024, the National Academies of Sciences, Engineering, and Medicine convened a hybrid workshop in Lucerne, Switzerland, hosted by the University of Lucerne, to facilitate a discussion focused on the WHO's concept of functioning and its role in rethinking the concept of health, with a focus on healthy aging and the future of rehabilitation as a health strategy. The planning committee developed the agenda for the workshop sessions, selected and invited panelists, and moderated the panels discussions. In designing the workshop, the planning committee focused on identifying opportunities and challenges in improving human functioning across the life course. The workshop convened an array of global experts in diverse fields from all WHO regions. The expertise of the invited speakers included aging and healthy longevity, disability studies and functioning, geriatric medicine, health economics and policy, physical and rehabilitation medicine, and public policy, as well as other areas. The workshop was open to the public, and audience members represented a variety of perspectives. This workshop proceedings is the rapporteurs' summary of the speakers' presentations and the moderated panel discussions. The moderated discussions included panelists' responses to questions from both the in-person and virtual audience, as well as audience comments; when identified, audience comments are attributed by name and affiliation. The workshop statement of task is provided in Appendix A, the agenda in Appendix B, the panel concept notes in Appendix C, and the biosketches of workshop planning committee members, invited panelists, and supporting scientists in Appendix D.

Walter Frontera, University of Puerto Rico School of Medicine (United States), opened the workshop by outlining the major themes to be explored, including the concepts of functioning, healthy longevity, and rehabilitation; the idea of functioning as a measure in health policy and methods for

[2] The Sustainable Development Goals are 17 global goals adopted by the United Nations in 2015. Goal 3 of "good health and well-being" includes 13 target goals to be reached by 2030. See https://www.undp.org/sustainable-development-goals/good-health (accessed April 16, 2024).

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

operationalization; the investment case for functioning and rehabilitation; the research ecosystem for functioning, aging, and rehabilitation; health services delivery and person-centered care; and the role of advocacy and communications in social policies. Victor Dzau, National Academy of Medicine (NAM) (United States), emphasized that healthy aging involves not only lengthening the lifespan but also extending the health span, allowing individuals to live well and productively throughout their lives. While the aging of the world's population will include "rising rates of chronic disease and disability, rising costs of care, and increasingly complex patient profiles," he said, keeping older adults healthy increases their "productivity and contribution to society." He suggested reframing this challenge as an opportunity for society. He described NAM's Healthy Longevity initiative, its associated grand challenge, and its roadmap published in 2022 (NASEM, 2022), noting that "healthy aging is an issue that affects all countries, and we have a real global imperative to address this, which is why collaboration across international boundaries is so important."

Gerold Stucki, University of Lucerne (Switzerland), and Bruno Staffelbach, University of Lucerne (Switzerland), both emphasized the University of Lucerne's commitment to functioning and well-being. Stucki described the Lucerne Initiative for Functioning Health and Well-being,[3] which has a mission to optimize functioning, health, and well-being in the face of acute and chronic diseases, injuries, and aging. He stated that the initiative is interested in pursuing global partnerships to promote a new understanding of health as functioning within society. Henri Bounameaux, Swiss Academy of Medical Sciences (Switzerland), noted that there is still room for the Swiss health care system to truly encompass the whole lifespan, including aging, functioning, and rehabilitation, adding that he believes reform is needed for the development of a sustainable Swiss health system, with a triple aim of "a population in good health, an individual high-quality care for all patients, and an accountable utilization of the financial, human, and natural resources." Bounameaux concluded his remarks with a charge for the workshop to further enrich the discussions toward a sustainable health system both globally and in Switzerland.

Over the course of the workshop, participants offered many suggestions for operationalizing functioning as a measure in health policy, rethinking disability as a universal human experience, and formulating a feasible public health agenda that addresses the increasing relevance of rehabilitation for the twenty-first century, and these are summarized in Box 1.

[3] Lucerne Initiative for Functioning, Health, and Well-being is a global initiative driven by the University of Lucerne. See https://www.unilu.ch/en/faculties/faculty-of-health-sciences-and-medicine/sections-centers-research-units/life/ (accessed April 16, 2024).

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

BOX 1[a]
Suggestions for Supporting Healthy Aging, Functioning, and Rehabilitation Made by Individual Workshop Participants

Improving Functioning Across the Life Course

- Shift the orientation of health systems away from a focus on mortality and morbidity to include functioning as the third indicator of health. (Bickenbach, Boggs, Chatterji, Gimigliano, Khan)
- Aim for conceptual clarity for functioning and rehabilitation, as rehabilitation seeks to optimize functioning. (Bean, Beard, Bickenbach, Cieza, Jette)
- Create functioning trajectories that span the life course to use in evaluating an individuals' functioning and the effectiveness (and cost-effectiveness) of interventions. (Beard, Prodinger, Stucki)
- Elevate standards and tools to rise above the "tyranny of low expectations," or low levels of ability described as baseline or acceptable, in the aging population. (Bean, Keith, Simonsick)
- Include age-appropriate metrics of success alongside indicators of failure in functional performance assessments, including maximum capacity testing, patient-reporting outcome measures, and other data collection methods. (Simonsick)
- Stratify older adult populations in order to target interventions that maximize functioning. (Beard, Chatterji)

Building the Economic and Investment Case for Functioning and Rehabilitation

- Use return-on-investment and cost-effectiveness studies to build the economic case for investing in functioning and rehabilitation, such as cost benefits and cost savings. For example, investments may enable older adults to contribute to society (cost benefits) and reduce the need for acute and long-term care (cost savings). (Boggs, Gimigliano, Sillitti, Willers)
- Develop direct measures for functioning, moving beyond indirect measures such as disability-adjusted life-years. (Beard, Reinhardt, Willers)

Supporting Rehabilitation Health Services as a Strategy for All People In Need

- Embrace new technologies to enable early identification of disease that could impair functioning and possibly avoid or delay disease onset. (Beard, Jette, Katz)
- Integrate rehabilitation into all components of health systems and in the community, not only in specialized services and centers. (Cieza, Frontera, Morsch, Mpofu)
- Encompass the whole lifespan, including aging, functioning, and rehabilitation, to develop sustainable health systems. (Bounameaux, Leonardi)

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

BOX 1 Continued

Exploring 360-degree Functioning-Based Health Research

- Use the International Classification of Functioning, Disability and Health (ICF) system as a foundation to "convert abstract concepts into quantifiable data" and use standards from the ICF to: establish comparability among measures for functioning; standardize reporting and data collection on functioning in health systems; assist in defining improved outcomes from rehabilitation in the context of research; serve as a context for understanding functioning's importance in health care delivery and policy; and consider its applicability to aging. (Beard, Bickenbach, Boggs, Engkasan, Gimigliano, Hajjioui, Leonardi, Prodinger, Reinhardt, Sillitti, Stucki, Willers)
- Develop hybrid assessment tools that combine self-reporting and clinical assessments. (Beard, Boggs, Prodinger, Simonsick)
- Create a clear, prioritized research agenda for the next five years that incorporates implementation research. (Bean, Chatterji, Engkasan)

Promoting Advocacy that Increases Support for Health Longevity, Rehabilitation, and Functioning

- Counter ageism, which limits access to rehabilitation and reinforces low expectations, by calling it out directly, but also recognize that supporting healthy longevity and aging means understanding that older adults can have different goals. (Bickenbach, Katz, Keith, Morsch)
- Establish human functioning sciences as a distinct discipline through mechanisms such as dedicated conferences and a scientific journal. (Beard, Cieza, Engkasan, Stucki)
- Develop curricula to train researchers in best practices—both conducting and disseminating research—for human functioning sciences. (Engkasan, Hajjioui, Reinhardt)
- Implement interprofessional approaches and models that optimize functioning, focus on the individual, and develop a more robust plan for evaluation and care, with an emphasis on community engagement across a variety of settings. (Hajjioui, Jette, Morsch, Willers)

[a]This list is the rapporteurs' summary of points made by the individual speakers identified, and the statements have not been endorsed or verified by the National Academies of Sciences, Engineering, and Medicine. They are not intended to reflect a consensus among workshop participants.

FOUNDATIONAL CONCEPTS

Throughout the workshop, presenters built on foundational work by the WHO, NAM, and other groups. This section provides an overview of terms, concepts, and models that workshop participants referred to repeatedly and discussed at length, though these definitions were not a focus of the workshop and consensus was not achieved or attempted on defining these terms.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Functioning

Jerome Bickenbach, University of Lucerne (Switzerland), defined *functioning* as "information about how a person's health state affects their daily life…information that describes the actual lived experience of health" (Bickenbach et al., 2023). He explained that functioning comprises the domains of both biological health (with biophysical information about bodily functions and structures), and lived health (with information about actual performance), where lived health is fully contextualized as an outcome of interactions between a person's intrinsic health capacity and features of their environment (Bickenbach et al. 2023; Stucki and Bickenbach, 2017, 2019). According to Bickenbach, functioning "accounts for the value of health because it tells us that health matters to us because it improves what matters to us, namely what we can do. It explains behaviors, why we move toward seeking health care. It allows us to predict future health needs in terms of what people's aspirations for what they want." He added that functioning also helps make sense of disability in a way that fully comprehends the experience, as a limitation in functioning in the person's environment. Alarcos Cieza, WHO (Switzerland), explained that functioning can be categorized by our body functions and structures (e.g., pain, muscle weakness), our activities (e.g., self-care, walking), and our participation (e.g., going to work or school). Matilde Leonardi, Fondazione IRCCS Istituto Nuerologico "Carlo Besta" (Italy), said that describing functioning is like describing the wetness of water in that the whole is obvious—how a person's health state affects their daily life—but the components (i.e., hydrogen and oxygen) by themselves do not explain the experience. Functioning is more than just the sum of its parts, but a comprehensive experience. She advocated for the initial definition of functioning as operationalizing health using a biopsychosocial model, with recognition that biological, psychological, and social factors interact and can affect functioning through different policies, systems, and services.[4]

WHO's International Classification of Functioning, Disability and Health

Several participants discussed using WHO's International Classification of Functioning, Disability and Health (ICF) to operationalize functioning in health systems and to build an evidence base for investing in functioning and for identifying effective interventions. Bickenbach said the ICF is designed to measure and compare differences in health, enabling function-

[4] The biopsychosocial approach systematically considers biological, psychological, and social factors and their complex interactions in understanding health, illness, and health care delivery. See: Engel, G. L. 1977. The need for a new medical model: A challenge for biomedicine. *Science* 196(4286):129-136.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

ing to serve as a third indicator of health, alongside mortality and morbidity. [5] The environmental, contextual, and personal factors that influence a person's functioning were discussed in depth (see Figure 1). Several presenters also referred to the discussion in a study by Bickenbach and colleagues (2023) of how functioning aligns with all six of the WHO's health system building blocks (see Figure 2). John Beard, Columbia University (United States) and previously director of the WHO Department of Ageing and Life Course, noted that the ICF has been revolutionary in the field of aging.

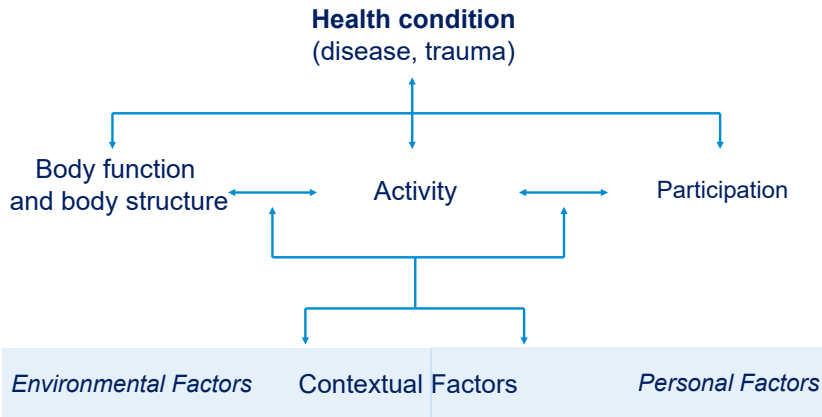

FIGURE 1 World Health Organization's model for the International Classification of Functioning, Disability and Health.
NOTES: Contextual factors include environmental factors and personal factors. Environmental factors make up the physical, social, and attitudinal environment in which people live and conduct their lives. These factors are external to individuals and can have a positive or negative influence on the individual's performance as a member of society, on the individual's capacity to execute actions or tasks, or on individual's body function or structure. Personal factors are the particular background of an individual's life and living and comprises features of the individual that are not part of a health condition or health state. These factors may include gender, race, age, other health conditions, fitness, lifestyle, habits, coping styles, social background, education, profession, past and current experience, and more.
SOURCE: Presented by Francesca Gimigliano, University of Campania, February 16, 2024. Adapted from WHO, 2001. CC BY-NC-SA 3.0 JGO.

[5] The WHO ICF model is not specific to health-related quality of life (HRQOL). Cieza and Stucki (2008) noted that while the WHO ICF categories under functioning can serve as the basis for the operationalization of HRQOL, these are not the only potential applications of the WHO ICF. Other frameworks, such as the Wilson and Clearly model, are specific to HRQOL. See Wilson, I. B., and P. D. Cleary. 1995. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA* 273(1):59-65.

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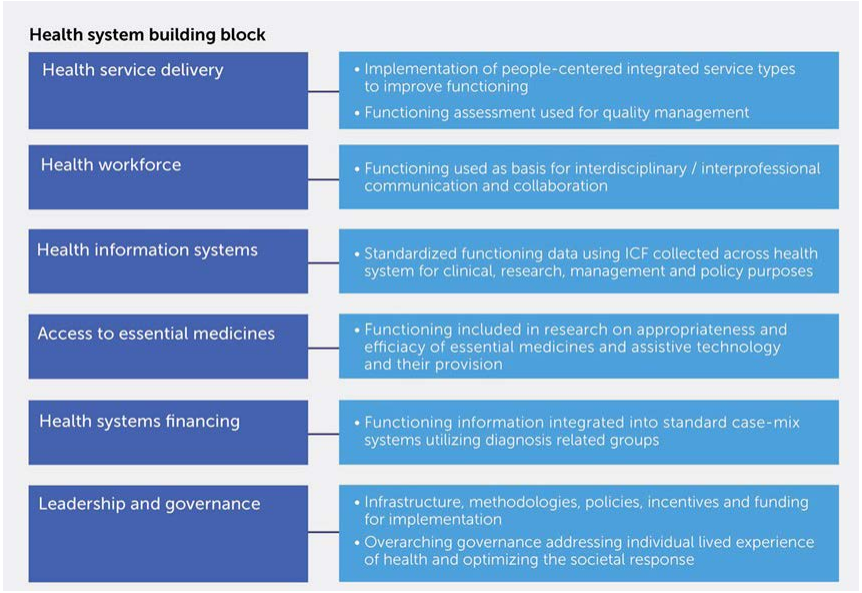

FIGURE 2 Highlights for implementing human functioning within health systems. NOTE: ICF = International Classification of Functioning, Disability and Health. SOURCE: Presented by Francesca Gimigliano, University of Campania, February 16, 2024. Bickenbach et al., 2023. CC BY 4.0.

Health Longevity and Aging

John Beard explained that the NAM *Global Roadmap for Healthy Longevity* defined *health longevity* as the state in which years in good health approach the biological life span, with physical, cognitive, and social functioning that enables well-being across populations (NASEM, 2022). He added that healthy aging is "not only lengthening the lifespan, but also extending the health span, allowing individuals to live high-quality, productive lives well into the later years."

Rehabilitation

Paola Sillitti, Organisation for Economic Co-operation and Development (OECD) (France), noted that *rehabilitation* is "sometimes a blurry term that includes many different types of services," including physical therapy, occupational therapy, speech and language therapy, cognitive therapy, and mental health therapy, and can be accessed in a variety of settings. Alarcos Cieza shared the WHO's definition of *rehabilitation* as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment"

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(WHO, 2023b). In her presentation, Francesca Gimigliano, University of Campania "Luigi Vanvitelli" (Italy), added that the definition of *rehabilitation* for research purposes is a "multimodal, person-centered, collaborative process including interventions targeting a person's capacity and/or contextual factors related to performance, with the goal of optimizing the functioning of persons with health conditions currently experiencing disability or likely to experience disability, or persons with disability" (Negrini et al., 2022). Throughout the workshop, participants and presenters discussed—and sometimes disagreed about—to what extent rehabilitation should occur primarily in clinical practice (responding to a particular medical condition) or within a public health agenda.

Disability-Adjusted Life-Years

Researchers often use disability-adjusted life-years (DALYs) to measure functioning in a public health or economic context (see Figure 3). Abderrazak Hajjioui, Abdelmalek Essaâdi University (Morocco), noted that the rehabilitation community can aim to improve the years lived with a disability, which can be reframed as "years lived without functioning, without quality of life, without well-being" for advocacy purposes. The use of DALYs and similar proxies was discussed at length, as was the need for more direct forms of measurement. For instance, Jan Reinhardt, Sichuan

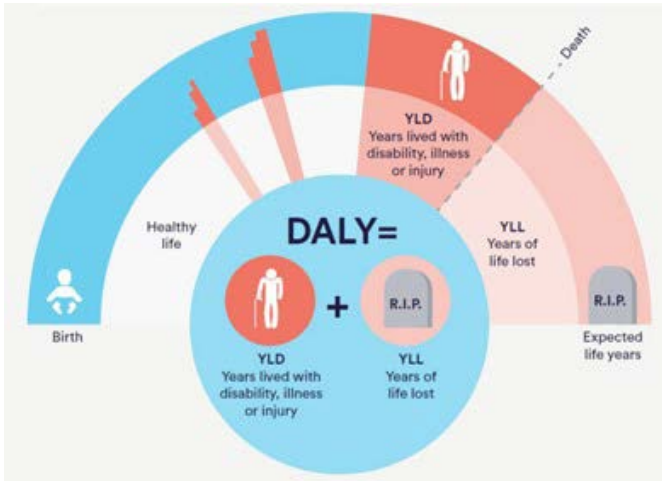

FIGURE 3 Disability-adjusted life-years.
NOTE: DALY = Disability-adjusted life-years; RIP = rest in peace (referring to death).
SOURCES: Presented by Abderrazak Hajjioui, February 16, 2024. Shah et al., 2019; originally adapted and reproduced through an Open Government License from Public Health England.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

University (China), commented that DALYs and similar units, which are often used to quantify burden of disease, rely on a "concept of disability that has absolutely nothing to do with how we see . . . and define" disability. Nonetheless, Carl Willers, Karolinska Institutet (Sweden), noted that such measures are currently used to build the case for investing in functioning and rehabilitation.

KEYNOTE PRESENTATIONS

The workshop began with presentations by three keynote speakers on the three focuses of the workshop: the functioning revolution, health longevity, and the WHO's concept of rehabilitation.

The Functioning Revolution

Jerome Bickenbach posited that while "we've been speaking in functioning all of our lives," its significance to our health and well-being is underappreciated and underacknowledged. He noted that the experience of health and what it means to a person to live with a condition is missing from society's concept and picture of health, which focuses solely on longevity, mortality, and morbidity. He used a personal example of how his foot joint pain is medically defined as concentrated urea crystals in his joint, which, while being important information, is an abstraction because it doesn't communicate the pain felt when walking. The condition affects how he moves through the world, which affects whether he achieves or fails to achieve what he wants to accomplish. He asserted that being able to achieve our goals and aspirations is why health matters to us.

Bickenbach stated that health systems need to be reoriented from assessing and addressing mortality and morbidity to assessing and addressing the experience of health conditions—that is, functioning. Doing so, he argued, would fulfill the United Nations (UN) Sustainable Development Goal 3: to ensure healthy lives and promote well-being for all at all ages. This goal implies a link between health and well-being, he continued; why does improving health improve well-being? "Well," he said, "living a long life is a good thing . . . but you can live a long life in utter misery."

Bickenbach pointed out that, while the idea of *well-being* is very simple ("being able to do and become what you wish"), multiple factors adversely affect well-being, like poverty, discrimination, and migration. Health, he added, can also be a barrier. Bickenbach explained that the International Classification of Diseases (ICD) is a way to categorize information about disease and morbidity in an internationally comparable, standardized way. The ICD allows researchers to collect information that contributes to the understanding of what health services are being provided—and, more

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importantly, he said, how those services can change outcomes. But the ICD does not enable data collection on what it is like to live with the conditions it describes; "we need to know what it's like to live those conditions," he stated.

Early on, said Bickenbach, the ICF was characterized as a complement to the ICD, to provide more comprehensive data collection for research. But the ICF was also intended "to capture something which had been missing in our understanding of health," he explained, to measure differences in health states and identify the impact of interventions. He said that morbidity and mortality are indicators of health, but "the space in which you live [health conditions] out," required a third, complementary indicator (Stucki and Bickenbach, 2017). "We use the term *functioning* for this space," Bickenbach stated, which identifies classifications of body functions and structures, as well as activities and participation.

According to Bickenbach, the major conceptual revolution is that functioning reveals the lived experience of health, and environmental factors shape and determine that experience as much as the biophysiological changes that occur with a morbidity. Two people experiencing the same condition but in different environments experience different functioning, he continued. Two people suffering knee arthritis, as he does, who are in different environments, will experience qualitatively and quantitively different functioning: "it's a different phenomenon to struggle to walk through snow uphill" than on flat ground, he explained. The environmental context, Bickenbach said, is a complex interplay of several factors made up of not only the physical elements of the environment (e.g., air quality, air pollution levels, altitude) but also human-built structures that can contribute to or interfere with health. Environment may also include assistance that mitigate such difficulties, interpersonal interactions, and social structures and legal systems.

Bickenbach clarified the relationship between intrinsic capacity and performance, emphasizing that distinguishing between these two concepts is central to the revolution of functioning and the theory of the ICF. Intrinsic health capacity, he said, is an abstraction of what we understand biophysiologically: information about the state of the body, expressed by functions and structures of basic biological components, known as biological health. This capacity is then translated and mediated through the environment, "which can contribute positively or negatively to an experience," resulting in the lived experience of a health condition, or functioning. Information about functioning, Bickenbach said, includes both the biophysiological state (intrinsic capacity) and its effect on a person's engaging in activities in their environment (performance), which describes information about how the state if the body affects all of the activities that a person actually engages in their actual environment. He asserted that the lens of performance offers

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

tools for changing environments, medications, and assistive technology. Disentangling capacity from performance enables a clearer understanding of what health services can offer when a person is facing diminished capacity, he said.

Bickenbach then discussed how the functioning revolution applies not only to population aging but also to noncommunicable chronic diseases. He noted that the most salient indicator of a chronic health condition is stable or progressive decline in capacity, with low chances for improvement. But even with reduced capacity, there are tools to improve performance, such as changing environments to make them more accessible, modifying medications and using assistive technologies.

Bickenbach said that functioning is the "basis for conceptualizing health itself." It links varying perspectives on capacity and provides a platform for operationalizing health, he explained. It also provides a way to measure improvement before and after an intervention. Functioning is revolutionary, asserted Bickenbach, because it shifts "the center of gravity" of health sciences. He concluded his presentation by adding that "a functioning-based approach to health sciences is a revolutionary way of entering into the domain and rearranging, coordinating, disentangling, and re-reconciling the health sciences in something which could literally be the first legitimate approach to interdisciplinary health research."

Healthy Longevity

John Beard described how recent changes in health sciences can influence and shift the global approach to aging and how functioning might be framed in the future. First, he mentioned the developing field of geroscience, which takes a biological perspective on aging. Second, he pointed out that an understanding of complex systems (e.g., related to climate change) has advanced, exposing the reality that change is often nonlinear and needs to be understood holistically. Third, he said, computational mechanisms, including machine learning, are enabling analysis of the "complex, dynamic biological changes that occur with age."

Beard asserted that this shift away from the traditional model, which waits for conditions to manifest before responding, has led to a tipping point in the field. He stated prevalence of chronic disease tends to increase with age and that "aging is the biggest risk factor for almost all of those chronic diseases, far more important than our behavior or other risk factors," but that "we're identifying the health changes very, very late." If clinicians wait until symptoms associated with a chronic conditions manifest, the best option is to limit progress of the condition, he explained. Although most people over age 65 are managing complex chronic morbidities, Beard continued, it is becoming possible to identify conditions earlier,

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

before crossing the symptom threshold, so that the chronic disease does not develop or is delayed until much later in life. Functioning declines long after the onset of biological and phenotypical deterioration, he said, due to the body's ability to compensate.

Beard stated that 2015 WHO World Report on Ageing and Health "framed healthy aging around the functional ability to be and do" what people value to foster well-being (WHO, 2015). People value feeling safe, having a place to live, having access to healthy nutrition, and being in a walkable and safe environment. Older adults also want to learn, grow, be mobile, and retain autonomy "to their last breath, if possible," he said, and importantly, older adults want to have relationships and contribute to society, and to be acknowledged. Being able to achieve this well-being relies on both the individual's health state and their physical and social environment, he said.

Adding to Bickenbach's discussion of capacity as an abstraction, Beard said that WHO's idea of intrinsic capacity includes all the individual-level attributes that contribute to ability. Capacity grows and develops over the life course, he said, then reaches a peak and declines gradually. The second half of life includes a significant range of capacity, said Beard, and the tendency to box older adults into one group of those age 65 and older is incorrect, as "one of the great hallmarks of aging is heterogeneity."

Beard emphasized that segmenting the population into groups enables appropriate policy responses to help them "build and maintain the highest possible level of capacity" (see Figure 4). This approach formed the basis for the UN Decade of Healthy Ageing, spanning 2021 to 2030, with four priority areas: (1) combatting agism and "changing the way we think, feel, and act about aging and older people"; (2) changing the built environment to allow people to experience aging positively; (3) reframing health systems to address chronic complex conditions that tend to accompany older age; and (4) ensuring access for all to health care and other forms of support.

Beard described WHO's Integrated Care for Older People (ICOPE) approach as being functioning-based (WHO, 2019). Using a model similar to that of pediatrics, ICOPE compares an individual's functional trajectory with population means. ICOPE's entry point is screening for functioning rather than disease, and if an individual screens below a certain level, they receive more in-depth assessment and an integrative care pathway. Beard reported that ICOPE is being scaled up in several places, such as in France.[6]

In order to make the concept of intrinsic capacity more concrete, Beard said that five subdomains of capacity (cognitive, sensory, locomotor, vitality, and psychological) can be assessed using common indicators, such as recall and verbal with cognitive capacity, or vision and hearing with sensory

[6] See https://www.icope.fr/ (accessed April 16, 2024).

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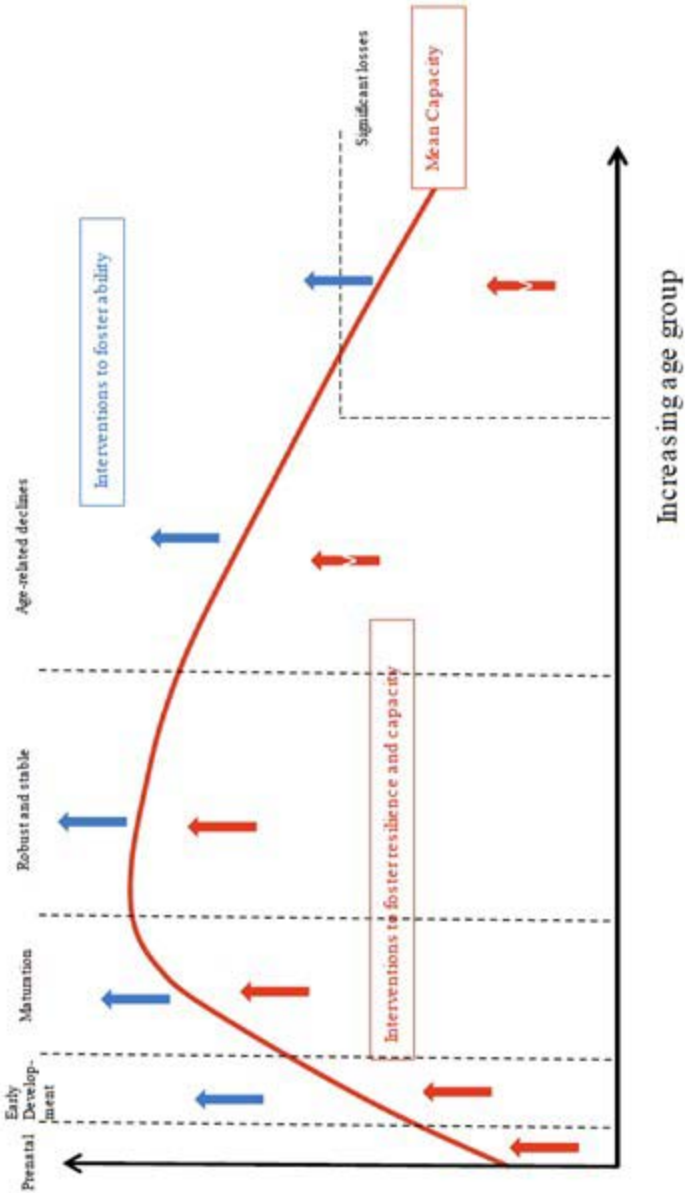

FIGURE 4 Life course opportunities for intervention.
SOURCE: Presented by John Beard, February 16, 2024. Beard et al., forthcoming.

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capacity. He cited two studies that reveal the power of capacity at predicting outcomes: One study from England demonstrated that after accounting for factors such as gender, age, education level, wealth and multimorbidities, intrinsic capacity strongly predicted the subsequent development of care dependence (Beard et al., 2019). Another in China showed similar associations (Beard et al., 2022). He linked the vitality subdomain specifically to potentially capturing the underlying biological changes that are the focus of geroscience, suggesting these biological changes ultimately become expressed as more overt capacities and provide resilience to allow people to recover from external stressors.

Beard discussed the Study of Health, Ageing and Retirement in Europe,[7] which revealed that people of lower socioeconomic status experience worse capacity as they age compared with those of higher socioeconomic status, and that those who need resources the most have the least access them Additionally, this study found vast differences among European countries in declines in capacity, indicating the role of environment and the mutability of these effects (Arokiasamy et al., 2015). Beard then examined the English Longitudinal Study of Ageing,[8] which looked at intrinsic capacity in four cohorts and found that more recent cohorts had slower reductions in capacity and that people are entering older age at higher capacities (mainly because they gained higher capacities earlier in life; Beard et al., 2019).

Beard discussed the National Academy of Medicine's *Global Roadmap for Healthy Longevity* (NASEM, 2022), which defines *healthy longevity* as "when the health span equals the lifespan." Although people are surviving diseases and thereby living longer, they often have more or more severe chronic conditions, he said; for example, people can survive a heart attack but still live with chronic heart disease. Beard closed by saying, "Now is the time to start thinking about how we can actually move forward and embrace all of these dramatic changes" in other fields and "reframe the way we think about aging and health."

Rehabilitation in Health Systems: The Time Is Now

Alarcos Cieza discussed the World Health Assembly's recent adoption of the WHO resolution on rehabilitation in health systems and emphasized how three factors contributed to the resolution: conceptual clarity on

[7] The Survey of Health, Ageing and Retirement in Europe is a research infrastructure for studying the effects of health, social, economic and environmental policies over the life course of European citizens and beyond. See https://share-eric.eu/ (accessed April 16, 2024).

[8] The English Longitudinal Study of Ageing is an ongoing study on a group of adults living in England ages 50 years and older. The study began in 2002, with interviews conducted at two-year intervals on multiple topics including demographics, social care, and functional capacity. See https://www.elsa-project.ac.uk/about-elsa (accessed April 16, 2024).

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rehabilitation; stakeholder cohesion; and support from individuals, countries, institutions, and organizations for the rehabilitation agenda. Cieza said the resolution focuses on ways that rehabilitation is fundamental for strengthening health systems with a political mandate, normative weight, and moral value. Box 2 summarizes Cieza's overview of the resolution's key components.

Conceptually, rehabilitation is about optimizing a person's level of functioning, Cieza said, and how interventions seek to reduce disability and work with people's environments toward optimal functioning. A key component of the WHO resolution was to support equity and improve access to high-quality rehabilitation services, she noted. Less than 50 percent of those who could benefit from rehabilitation services have access to them (Cieza et al., 2021). The only mechanism for achieving equity, she declared, is ensuring that rehabilitation services are part of universal health care coverage through the strengthening of health systems so that people can receive needed services without facing financial hardship. She added that rehabilitation services should be integrated not only in specialized centers but also at the secondary, tertiary, and community levels to ensure comprehensive coverage and access.

BOX 2
World Health Assembly Resolution 76.6 on Strengthening Rehabilitation in Health Systems: An Overview[a]

On May 30, 2023, the WHO passed Resolution WHA76.6, *Strengthening Rehabilitation in Health Systems.* Alarcos Cieza summarized the major components of the resolution:

1. Requests that the WHO Director-General continues the work of producing evidence, engaging stakeholders, and supporting countries.
2. Urges member states to integrate rehabilitation in their national health plans and policies, taking action in
   (a) financing,
   (b) expanding services and the health services workforce,
   (c) developing health information systems,
   (d) continuing quality research,
   (e) establishing rehabilitation in emergency services, and
   (f) developing assistive technologies.
3. Invites civil society to collect data for evidence-based policymaking, research and innovate assistive technologies, and advocate for rehabilitation.

SOURCE: Presentation by Alarcos Cieza, February 16, 2024; WHO, 2023a.

[a]This list is the rapporteurs' summary of points made by the individual speaker identified.

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Cieza explained that the resolution required "stakeholders' cohesion", which was garnered through the Rehabilitation 2030 initiative.[9] These efforts included producing evidence, such as the 2019 Global Burden of Disease Study, which reported that 2.4 billion people globally experience a health condition that could benefit from rehabilitation (Cieza et al. 2021). This figure increased by 63 percent in 30 years, driven by the aging population. Cieza also mentioned a special issue of the *WHO Bulletin* on advancing rehabilitation through health policy and systems research (WHO, 2022b) and the guidebook *Clinical Management of COVID-19* (WHO, 2023c), which showed that rehabilitation is essential for the clinical management of infectious diseases, as well as other conditions. Through Rehabilitation 2030, Cieza said, WHO also developed technical tools for strengthening health systems, such as the *Package of Interventions for Rehabilitation*.[10] Cieza reported that WHO worked for 3 years with 725 rehabilitation experts from all 6 WHO regions to create these technical tools, and these efforts contributed substantially to stakeholder cohesion.

Finally, Cieza explained, passing the resolution required the work of "champions". She said that these included individuals, many of whom participated in the workshop, academic institutions, organizations such as nongovernmental organizations and foundations, and WHO member states. In closing, Cieza invited participants to study the resolution and also challenged participants to use the resolution to inform their deliberations throughout the workshop and beyond.

FUNCTIONING AND REHABILITATION FOR HEALTHY LONGEVITY

Somnath Chatterji, formerly of the WHO, opened the first panel session by discussing tools and standards for measurement necessary to move the field forward. He remarked on the importance of measurement, saying, "What you measure is what you manage, and what you manage is what you change."

Operationalizing Functioning for Population Health

Francesca Gimigliano explained that rehabilitation is key to optimizing functioning. She discussed the importance of contextualizing functioning and presented different tools and methods in operationalizing functioning

[9] See https://www.who.int/initiatives/rehabilitation-2030 (accessed April 17, 2024).

[10] See https://www.who.int/activities/integrating-rehabilitation-into-health-systems/service-delivery/package-of-interventions-for-rehabilitation (accessed May 10, 2024).

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and rehabilitation in health care settings. Understanding a person's functioning in context is key, said Gimigliano. She illustrated why context matters with an example of astronauts, who often have very high intrinsic capacity on Earth but limited capacity in a different environment like the moon.

Gimigliano noted that although there are differing definitions of rehabilitation, functioning is a critical aspect of rehabilitation. She outlined several tools to describe the building blocks of integrating functioning across health systems, including the International Classification of Service Organization in Rehabilitation,[11] the Individual Rehabilitation Project,[12] the Scheda di Dimissione Ospedaliera in Riabilitazione,[13] Standardized Assessment and Reporting System for functioning information,[14] the WHO's Model Disability Survey,[15] and the International Society of Physical and Rehabilitation Medicine's Clinical Functioning Information Tool (ClinFIT).[16]

Gimigliano said that key to functioning as it relates to the ICF is participation or performance, which is "the ultimate goal of rehabilitation." She suggested that advancing technologies such as the Metaverse could enable individuals to return to participation in new way (Calabrò et al., 2022). She concluded that "functioning really depends on the timing, on the context, on the place, and on everything that is around us."

Role of Functioning in Healthy Longevity Research

Eleanor Simonsick, National Institute on Aging (United States), discussed three areas of functioning in healthy longevity research: hands-on functional performance testing, functional assessment, and assessing age-appropriate metrics of success. She stated that functional performance

[11] See Gutenbrunner et al., 2020.

[12] See Zampolini et al., 2022.

[13] The Scheda di Dimissione Ospedaliera in Riabilitazione is a tool for collecting information relating to each patient discharged from public and private hospitalization institutions throughout the national territory. In English, this is known as the "Hospital Discharge Form in Rehabilitation." See https://www.salute.gov.it/portale/temi/p2_5.jsp?lingua=italiano&area=ricoveriOspedalieri&menu=rilevazione (accessed April 18, 2024).

[14] The Standardized Assessment and Reporting System for functioning information is a methodology for developing an interval-scaled common metric system to apply the ICF in different settings to assess and report functioning information in a standardized manner. It builds upon the ICF framework. See Maritz et al., 2020; Prodinger et al., 2016; Prodinger et al., 2018.

[15] The Model Disability Survey is a survey tool that provides comprehensive information about the levels of disability in a population. See https://www.who.int/news-room/questions-and-answers/item/model-disability-survey (accessed April 18, 2024).

[16] The Clinical Functioning Information Tool (ClinFIT) is a tool developed under the auspices of International Society of Physical and Rehabilitation Medicine based on the 30 ICF categories of the ICF Generic-30. ClinFIT can be tailored and adapted for specific patient groups and settings. See Frontera et al., 2019.

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assessments are essential as many individuals are unaware of their capacities and limitations; functional performance testing is just the beginning as the behaviors and health conditions that underly or contribute to deficient performance are vast; and functional performance testing should tap capacities as well as limitations, with evaluation criteria accounting for age, sex, and size.

She explained that many people are unaware of their limitations or may underreport the severity of their impairments, so performance tests can provide a more accurate assessment of functioning. Simonsick described the Health, Aging and Body Composition Study,[17] which evaluated older adults who reported no difficulty with walking a quarter mile (or 400 meters), climbing a flight of stairs or activities of daily living using an objective walking test covering 400 meters. Participants were first assessed by phone, and eligible participants received a secondary assessment during a home visit. Following these two assessments, nearly 400 participants, or 12 percent, were excluded from the walking test due to health-related exclusion criteria (e.g., an electrocardiogram abnormality), and 356 participants could not complete the test because of an overly elevated heart rate, chest or leg pain, shortness of breath, or excessive fatigue. Stoppage or exclusion from the test predicted walking difficulty two and a half years later. Walking test performance also predicted cardiac outcomes and mortality (Newman et al., 2003).

Next, Simonsick explained that functional assessment is like a curtained window to health and aging, in that while functional performance testing can reveal limitations, it does not necessarily reveal the underlying causes (i.e., what is on the other side of the window). The Lifestyle Interventions and Independence for Elders Study sought to understand whether structured physical activity could delay onset of disability for people on the cusp of mobility disability and found statistically significant but nonetheless weak differences between the intervention and control groups.[18] In addition to an overall weak impact of the mobility intervention, Simonsick noted that around 60 percent of the 800 total participants went on medical leave at least once, and 25 percent went on medical leave at least twice during the study period (Pahor et al., 2006). Simonsick also shared the study results within selected population subgroups, noting that the activity intervention was not successful in those with cardiovascular disease, as it did not address the likely underlying cause(s) or provide appropriate rehabilitation services.

[17] The Health, Aging and Body Composition Study is an interdisciplinary study that began in 1997 and collected data for 17 years on a cohort of Black and White adults living in two U.S. cities. See https://www.nia.nih.gov/healthabc-study (accessed May 10, 2024).

[18] The Lifestyle Interventions and Independence for Elders Study was a National Institute on Aging clinical trial that studied 1,600 sedentary older adults over a 2.7-year period. See https://www.clinicaltrials.gov/study/NCT01072500 (accessed April 18, 2024).

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Likewise, individuals exhibiting mild cognitive impairment also did not derive benefit from the activity intervention as it did not target cognitive challenges.

Simonsick concluded her presentation by discussing the "tyranny of low expectations" and stressed the importance of including age-appropriate metrics of success alongside indicators of failure. Simonsick illustrated this point by highlighting several longitudinal cohort studies on sarcopenia—age-related loss of muscle mass and strength, which has been evaluated using grip strength, chair stand performance, and gait speed (Cleveland Clinic, 2022). Simonsick used an article providing normative data from 12 studies of British participants to illustrate that men and women ages 60-65 with grip strength below the fifth, tenth, or fifteenth percentile for their sex and age group do not meet age-agnostic criteria for sarcopenia (Dodds et al., 2014), whereas high proportions of those older than 80 performing in the 75th percentile for their age would be deemed sarcopenic. Simonsick emphasized that in a resource-limited environment, young-old individuals performing well below their age-peers and just beginning to decline may derive more benefit from active rehabilitation than individuals in their nineties performing well relative to their peers.

Monitoring Functioning for Health Systems: Lessons Learned

Alan Jette, Boston University (United States), shared lessons he has learned when working with health systems in monitoring patients' functioning throughout the episode of care. Jette reiterated the importance of conceptual clarity and said that monitoring functioning should be done at the level of an individual's performance of activities, which can help researchers and clinicians describe, measure, and explain the interaction between an individual's biological health and the environment. He argued that both capacity and actual daily life performance are important because they provide different information and emphasized that when discussing functioning, a focus on an individual's behavior in an environmental context, not on body systems and organs, is necessary.

Jette said a key lesson is being very selective in what health systems monitor, as too much detail may not be useful. Rather than a universal core set of functions, he said that health systems should focus on monitoring selective functions that reflect the system context for a specific purpose or application. Jette also emphasized the importance of collaborating with health systems, clinician and patient groups, and content and health system experts. Partnerships with these groups have changed the way functioning is monitored in health systems.

The next lesson, Jette said, is accepting and adopting contemporary approaches and tools. Classically, monitoring function used a set of fixed

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items regardless of their appropriateness to a particular patient (e.g., the Functional Independence Measure). And while many instruments for measuring functioning are available and can be useful, most are setting-specific, generate different scores, cannot be compared easily, and need many items or instruments to cover all relevant functional outcomes, which can be burdensome. Newer approaches include the Item Response Theory,[19] a group of measurement models where outcome scores are item-based rather than test-based and scored on probability models. This enables quantitative measuring of function and leaves behind traditional ordinal scores. Another innovation is computerized adaptive testing (CAT),[20] which can integrate Item Response Theory efficiently on large scales using an algorithm that selects a functional item based on a patient's previous response. Jette said his work using CAT in the Activity Measure for Post-acute Care[21] can be completed by either clinicians or patients and is sensitive to clinically meaningful change.

Finally, Jette said, functional monitoring needs to be adaptable and simple. For example, colleagues from the Cleveland Clinic asked for an adaptation of Activity Measure for Post-acute Care that did not include CAT, which was impractical for their health system. In simplifying the instrument, the team was able to use Item Response Theory to track selected items that improved decision making in referrals and discharge planning. Jette's team also developed short-form tests without CAT technology, versions of which are being used by more than 1,000 health care institutions in the United States.

Panel Discussion

In response to Jette's call for conceptual clarity, John Beard suggested that there is a philosophical difference between the current approaches toward aging science and clinical rehabilitation. The latter tends to measure and restore significant losses, he said, whereas the field of aging science seeks to identify and prevent incremental changes early on. Gerold Stucki expressed his worry that different approaches to rehabilitation and aging may divide the world, commenting that rehabilitation is a health strategy for improvement in all settings, not just clinical. Jan Reinhardt noted that the environmental setting is important when considering measurement, as

[19] Item response theory refers to models that explain the relationship between unobservable characteristics or attributes and their observed outcomes, responses, or performance.

[20] Computerized adaptive testing is a type of computer-based testing that adapts and responds to the test-taker's ability level.

[21] Activity measure for post-acute care (AM-PAC) is an instrument that assesses an individual's execution of discrete daily tasks in their environment across major domains defined by the ICF. See Haley et al., 2004.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

capacity and performance may differ based on the presence of facilitators or supports. Jette responded that conceptually, the capacity to function is different than actual functional behavior or daily life performance. Fary Khan, University of Melbourne (Australia), mentioned that for older adults, it is often not a single impairment but cumulative and multiple deficits that lead to functional decline, citing research with individuals with multiple sclerosis.

Reflections on Operationalizing Measurement of Functioning

On the second day of the workshop, a breakout group composed of the first panel's speakers and other workshop participants discussed how to advance functioning measurement.[22] Chatterji reported on the group's discussion on two aspects of measurement: (1) monitoring population health using functioning, as well as whether health interventions are improving population health and disease burden, and (2) creating measures that improve clinical management of patients, with implications for both clinical epidemiology and the impact of interventions. He highlighted the need for matching patients' profiles with specific interventions to improve outcomes and co-effectiveness.

In discussing future action, Chatterji stated that a clear research agenda identifying priorities and milestones for the next five years is needed. Additionally, referencing implementation of functioning measures within national health information systems would demonstrate proof of concept. Chatterji asserted that because burden of disease is important to the public health agenda, collaboration with those involved in measuring disease burden is critical, with the hope of potentially shifting their thinking as it relates to measurement. Collaboration is also needed, he said, with research funders, patient associations, and philanthropies.

Other members of the breakout group discussed stratifying the population by risk and other factors to enable early identification and targeted interventions. The group also discussed how to study the two-way relationship between determinants of health and functioning; monitoring functioning over time to assess cohort effects, rates of decline, and impact of interventions; and examining factors that determine older adults' functional capacities compared to actual functional performance.

In response to Chatterji's report on measuring functioning at the population level, Beard commented on the need for direct measures of functioning, stating that DALYs (see Figure 3) and healthy life expectancy are

[22] This section describes the report-backs of discussions that occurred during a breakout session. Statements, recommendations, and opinions expressed are those of individual participants and should not be construed as reflecting any group consensus.

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indirect measures. He expressed concern that overlaying aging with functioning will promote ageism, sharing the example that measuring workforce participation does not apply equally to all. An impoverished older person who has lost significant capacity through years of heavy work may continue to participate in the workforce out of necessity, not because they are healthy.

Leonardi suggested that the five-year plan could call for studies on risk factors and determinants of health because these factors are modifiable. Chatterji replied that "we have to pick our battles here"; making the case that burden of disease is an inadequate measure and demonstrating the feasibility of direct measurement of functioning in the population would be immense progress, he asserted. Walter Frontera commented on the need to develop tools for collecting data and making the economic case for investment in functioning and rehabilitation. Chatterji replied that numerous tools are available (e.g., ClinFIT and ICF Standardized Assessment and Report System), but domains need to be identified that span from patients in a clinical setting to healthy individuals in a community.

MAKING A COMPELLING INVESTMENT CASE FOR OPTIMIZING FUNCTIONING

Gerold Stucki moderated the second panel, on building the evidence base to make the economic case for investing in rehabilitation and functioning. He mentioned that while expanding services and insurance coverage may be the first area to address, proactive, innovative solutions are needed to shift the focus from merely treating health conditions to a more comprehensive approach to optimizing functioning.

Measuring and Enhancing Functioning in Health Systems

Paola Sillitti presented the importance of measuring what matters to people by gathering data on their health, well-being, and functioning, and on how to build the economic case for rehabilitation. In 2021 OECD countries spent an average of 15 percent of their budget on health (OECD, 2023).[23] Investments in health typically focus on preventing and managing chronic conditions, Sillitti continued. The outcome of these expenditures is that people are living longer: in 2022 the average life expectancy in OECD countries was approximately 80 years, which is up from around 68 years in 1960 and 77 years at the turn of the century (OECD, 2023). Preliminary data from the OECD Patient-Reported Indicator Surveys also showed that

[23] The OECD has 38 member countries. See https://www.oecd.org/about/members-and-partners/ (accessed April 18, 2024).

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people's rating of their health depended more on the number of chronic conditions they were facing than on their age (OECD, 2023).

Historically, researchers first focused on measuring mortality and life expectancy, then moved toward understanding levels of disability and now toward measuring well-being. There is growing interest in measuring what really matters to people, though gathering such data is challenging, she explained. Since 2017 the Patient-Reported Indicator Surveys initiative has sought to center people's needs and preferences in health systems performance assessment, which is at the core of OECD's new framework (OECD, 2024; see Figure 5).

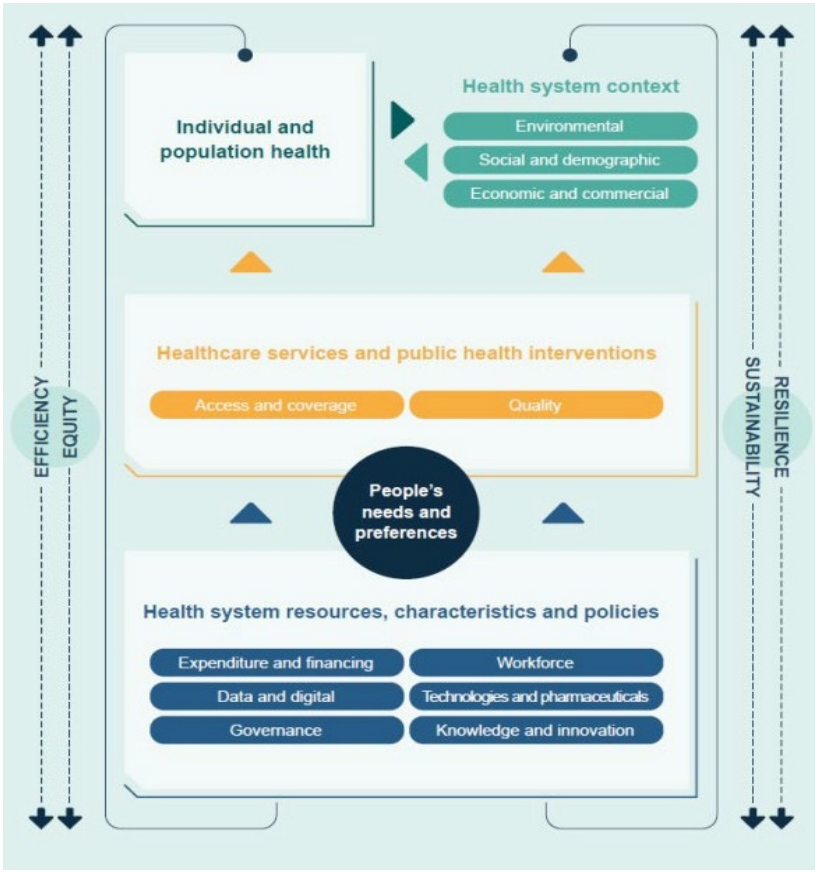

FIGURE 5 Health system performance assessment framework by the Organisation for Economic Co-operation and Development.
SOURCE: Presented by Paola Sillitti, February 16, 2024. OECD, 2024.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Sillitti continued by stating that investments in health are necessary for curative care, as well as preventing and managing chronic conditions and supporting functioning. Rehabilitation is an important component of these objectives, and rehabilitation services are available in 86 percent of OECD countries.[24] She added that the evidence base is small but growing for demonstrating the effectiveness of rehabilitation. Some existing evidence shows that rehabilitation might provide both cost benefits and savings. Rehabilitation could also enable older adults to continue contributing to the "economy of well-being," she said. When people contribute to society, they also contribute to economic advancement, leading to healthier populations with higher levels of well-being. Additionally, rehabilitation supports older adults after they receive acute care, when they are more likely to have accidents and falls—thereby reducing the risk of receiving additional (and costly) acute care, according to some existing evidence. She added that investments are needed to establish a stronger evidence base to demonstrate these benefits of rehabilitation. She concluded her presentation by inviting those interested to review OECD's work on the Patient-Reported Indicator Surveys initiative and other efforts, such as the *Health at a Glance* report (OECD, 2023).[25]

Building Evidence for an Investment Case

Carl Willers discussed the investment case for optimizing functioning for healthy aging and longevity. Because resources are scarce and interventions are costly, defining the indicators for functioning is essential. Health indicators have historically focused on morbidity and mortality and most resources are concentrated on reducing those. But if these indicators are not sufficient to explain individuals' degree of well-being and if efforts to address these do not correlate with well-being, then resources may be concentrated in areas that are not of the highest priority, he explained. He added that health-related quality of life is traditionally used to indicate the benefit of a given treatment but may differ from actual lived health without accounting for the contributions a person may make to society as a result of reducing burden of disease.

Willers stated that building a case for optimizing functioning will require high-quality data to demonstrate the cost difference in outcomes with new versus old interventions (see Box 3). Additionally, data can show value based on outcomes from an intervention compared with the costs of that intervention. Worldwide, 2.4 billion people would benefit from

[24] These are preliminary data from OECD.
[25] See https://OECD.org/health (accessed May 10, 2024).

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BOX 3
Characteristics of Functioning and Cost Data Needed to Build an Investment Case

Carl Willers presented characteristics of data needed to build a case for investing in functioning. Data should be:

- Structured and standardized, applying the International Classification of Functioning, Disability and Health to enable comparison across conditions and contexts;
- Granular in detailing both outcomes and costs;
- Contextualized and based on individual preferences;
- Routine-based for registration and reporting;
- Accessible for continuous monitoring and research;
- Complete, including both direct and indirect costs; and
- Transparent about methods used (e.g., how expense categories were allocated, approach for quantifying indirect costs).

SOURCE: Presented by Carl Willers, February 16, 2024.

rehabilitation services (Cieza et al., 2021).[26] In the United States, the cost-effectiveness of rehabilitation interventions could save an estimated $15.5 billion annually (Neumann et al., 2014).[27] Willers asserted that rehabilitation efforts are needed in many sectors in addition to health care, including the labor market, education, and social affairs and leisure.

Panel Discussion

In response to Willers's comments on a multisector approach to rehabilitation, Leonardi cautioned that defining *functioning* broadly may be "deresponsibilizing everyone," implying inaction because no one in particular bears responsibility to solve the problem. Willers agreed that the multisectoral approach risks diluting the value of rehabilitation and that the first step is building evidence for rehabilitation interventions within health care. However, he said, this does not contradict the need for continued data collection, research, and studies to show ministries of health that investment

[26] The cumulative estimate of 2.4 billion people living with a disability equals about 310 million years lived with disability. Years of healthy life lost due to disability is defined as one full year of healthy life lost due to disability or illness. See https://www.who.int/data/gho/indicator-metadata-registry/imr-details/160 (accessed May 10, 2024).

[27] In U.S. cost-effectiveness studies, $50,000 is the most commonly cited cost-per-QALY threshold. See Grosse, 2008.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

should occur across all sectors. Sillitti brought up "health in all policies" as a precedent for this approach and said involving other sectors does not necessarily dilute efforts but makes them stronger with more support.

Beard commented that the Global Burden of Disease does not account for the benefits of rehabilitation; people who are recovering from a disease would still be counted in prevalence data. Willers responded that the aim is to add a functioning perspective to a common unit of measure, such as DALYs. Jerome Bickenbach warned against mixing descriptions (e.g., does a person have deficits?) and assessments of functioning (e.g., do those deficits bother them?) and said that using a description such as DALYs as a proxy for assessment can be confusing. Sillitti replied that the two complement rather than oppose one another, and Willers add that the maxim "don't let the perfect become the enemy of the better" can be useful, as seeking a perfect indicator or measurement should not conflict with striving for improved tools. Walter Frontera asked whether the rationale built on the OECD data can be applied to low- and middle-income countries (LMICs). Sillitti replied that OECD mainly comprises high- and middle-income countries, but the cost-effectiveness of rehabilitation should apply to LMICs as well.

One workshop attendee asked about the bottleneck in data collection. Willers said, "It's at least partially a matter of comparability," and said using the ICF would enable comparisons across diseases and in other contexts. Stucki agreed, noting that the data may be available and the ICF can be used as a reference system to map the data. Sillitti added that health care research is "data rich but information poor"—in other words, lots of data are available but the tools to interpret them properly are less so. Vanessa Seijas, University of Lucerne, said, "Some people could argue that we have been measuring functioning for a long time," citing the 36-Item Short-Form Health Survey, used in the Nurse Health Survey since 1992, which asks questions such as how conditions limited a person's ability to perform tasks in the last four weeks.[28] She asked Willers to comment about the challenges seen so far. Willers responded that two obstacles are the subjectivity of patient-reported data (such as in the 36-Item Short-Form Health Survey) and the need for greater context specificity. Elias Mpofu, University of North Texas (United States), asked whether subjective costs are adequately measured when using cost-effectiveness and utility to demonstrate value. Willers agreed that suffering, pain, and other categories need to be acknowledged and included in the equation.

[28] The 36-Item Short-Form Survey is a tool used to assess quality-of-life measures. See https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form.html (accessed April 18, 2024).

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Reflections on Building the Economic Case for Functioning and Rehabilitation

On the second day of the workshop, Sillitti reported back on the discussion from the breakout group on economics,[29] which discussed developing policies that allow people to "live better, improve their well-being," and that incorporate people's health, social system, and environment. Because these policies must be evidence driven, the evidence itself needs to be developed, ideally using a learning health system approach, she explained. Sillitti emphasized that economic outcomes need to include affected people's viewpoints, such as the importance of contributing within their workplace or living independently. Outcome measures need to account for both formal and informal costs, including long-term care and social services. Data collected need to be accessible and interoperable, and they need to reflect the continuum of care across the lifespan and across sectors. These qualities will address the issue of the health care sector being "data rich and information poor," where data are available but not linked or comparable for use in a meaningful way, she explained.

The participants in this breakout group said that the understanding of conceptual frameworks and measurement instruments for disability, functioning, and well-being need to be clarified as two distinct but complementary things. Additionally, infrastructure needs to be developed to enable standardized reporting of functioning information. Making an investment case includes demonstrating opportunity costs, showing the cost of *not* investing in rehabilitation across sectors or having adequate access to adequate services, and aligning incentives for those who are financing services and those receiving positive spillovers from implementing services.

Abderrazak Hajjioui commented that the field needs more studies about opportunity costs for LMICs specifically, because while governments in these countries do not need to be convinced that rehabilitation is important, they need to see that these investments affect the gross domestic product. Policymakers may be convinced, he continued, if they see that they are losing money by investing only in acute medicine, especially when patients go home to die of complications. Patricia Morsch, Pan American Health Organization (PAHO) (United States), agreed, saying that disaggregating information can demonstrate the benefits of rehabilitation on older adults because long-term care for these individuals is expensive for countries.

Leonardi commented that instruments are needed for demonstrating that rehabilitation helps to maintain a level of functioning and that without it, functioning levels would worsen. Most measures are designed to show

[29] This section describes the discussions that occurred during a breakout session. Statements, recommendations, and opinions expressed are those of individual participants and should not be construed as reflecting any group consensus.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

improvement rather than maintaining the same function, she added. Diana Pacheco, University of Lucerne, responded that economists make the case for an intervention by comparing people who have a health condition with members of the general population who have similar characteristics but lack that health condition; this allows for measuring the benefits of maintaining functioning, even if the intervention does not improve functioning. Stucki brought up the need for functioning trajectories that demonstrate how a person's functioning would be affected without an intervention (a counterfactual), which would enable cost analysis and evaluation of both overall effectiveness and cost-effectiveness.

IMPROVING REHABILITATION IN HEALTH SERVICES DELIVERY AND CARE ACROSS THE LIFE COURSE

NiCole Keith, Indiana University (United States), introduced the panel on health services delivery by emphasizing that rehabilitation is a public health strategy that extends beyond the health care sector. Referencing the billions of people who lack access to health care, she emphasized that if measurement is only occurring in health care settings, then "we're missing a large percentage of the population." Panelists described the implementation of rehabilitation strategies in the health systems in various parts of the world, emphasizing the role of the community and environment in individual functioning.

Rehabilitation as a Strategy for Promoting Healthy Aging

Patricia Morsch presented on ways rehabilitation can serve as an interprofessional and transdisciplinary strategy to support healthy aging and healthy longevity. In PAHO countries, the gap between life expectancy and healthy life expectancy is 12 years (PAHO, n.d.).[30] Functioning can be optimized in spite of diminished capacity through appropriate and timely interventions in the health system (e.g., rehabilitation), long-term care, and age-friendly environments (see Figure 6). Morsch added that rehabilitation needs are increasing with age and thus emphasized the importance of having rehabilitation services specifically for older adults, as well as preventive care.

Morsch described PAHO's ICOPE framework for implementing a strategy for promoting healthy aging (see Figure 7). These guidelines support health professionals at the micro, meso, and macro levels (see Meyer et al., 2014). ICOPE starts with a person's intrinsic capacity and develops a more

[30] Data for the widening gap between life expectancy and healthy life expectancy between 1990 to 2017 comes from the Global Burden of Disease Collaborative Network. See https://vizhub.healthdata.org/gbd-results/ (accessed April 18, 2024).

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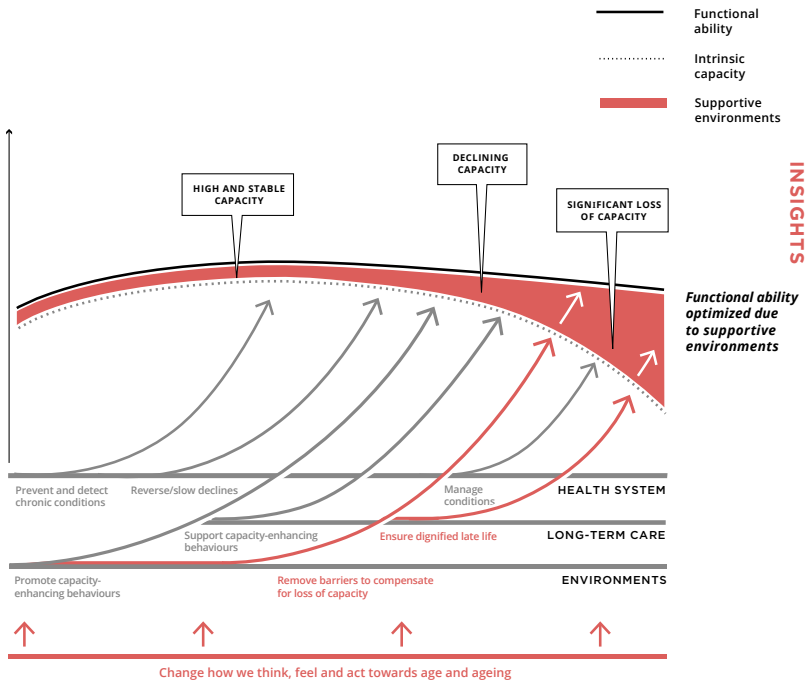

FIGURE 6 Trajectories of healthy aging: Optimizing functional ability.
SOURCES: Presented by Patricia Morsch, February 16, 2024. Adapted from WHO. 2021. *Decade of healthy ageing: Baseline report*. https://www.who.int/publications/i/item/9789240017900 (accessed April 3, 2024). WHO is not responsible for the content or accuracy of this adaption.

in-depth, person-centered plan for evaluation and care, with an emphasis on community engagement. It also involves risk assessment to enable interventions to begin before capacities are lost.

With a focus on functioning, ICOPE can been adapted to the realities of each PAHO country where it is implemented. The strategy aims to incorporate functioning in the practices already in place in each country, with a community worker or case manager to integrate the information and help the individual navigate referrals to community services, keeping the emphasis on what is important for each person.

Morsch presented two examples of programs that PAHO has used to implement ICOPE and increase community engagement. The Community Aging in Place Advancing Better Living for Elders program, which is being implemented in the United States, connects older adults with a repair worker, occupational therapist, and nurse to improve functioning.[31]

[31] See https://nursing.jhu.edu/faculty-research/research/projects/capable/ (accessed April 12, 2024).

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FIGURE 7 Integrated Care for Older People.
NOTE: IC = intrinsic capacity; FA = functional ability.
SOURCES: Presented by Patricia Morsch, February 16, 2024. Adapted from WHO. 2019. *Handbook: Guidance on person-centered assessment and pathways in primary care*. Integrated Care for Older People. https://iris.who.int/bitstream/handle/10665/326843/WHO-FWC-ALC-19.1-eng.pdf (accessed April 3, 2024).

Through this program, a repair worker might provide adjustments to the patient's home so that they can remain living there with improved functioning. Initial evidence points to improvements in activities of daily living and reduction in depressive symptoms and home hazards (Szanton et al., 2016). Second, Vivifrail is a 12-week program that prescribes home-based exercise based on results of a functional test, with the goal of improving functional capacity.[32] Participants receive a passport book with their exercises, and after 12 weeks, they receive a new passport of exercises tailored to their improvements through the program. Vivifrail is a unique intervention as it allows participants to complete exercises at home and does not require a health care provider or rehabilitation professional.

Prehabilitation, Prevention, and Maintenance for Maximizing Functioning

Fary Khan spoke about the clinician perspective in the Asia-Pacific region,[33] and ongoing work on integrating prevention into rehabilitation ("prehabilitation") and optimizing functioning in multiple programs. By 2050 an estimated 59 percent of the world's population of those aged 80

[32] See https://vivifrail.com/ (accessed May 10, 2024).
[33] The Asia-Pacific region includes more than 53 member states. For a complete list of countries, see https://www.un.org/dgacm/en/content/regional-groups (accessed May 10, 2024).

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years and older will be living in the Asia-Pacific region (United Nations, 2022).

In Australia, 4.4 million people (18 percent of the population) have a disability (Australian Institute of Health and Welfare, 2022). Rehabilitation service delivery within the public hospital system in Melbourne aims to reduce variation in clinical practice by standardizing community care and reducing the incidence of people returning to the hospital. The health system operates with a hub-and-spoke model, where the rehabilitation clinician connects patients with resources both inside and outside the health care system. She added that longer-term surveillance is critical. The Australian Rehab Outcome Center is the second-largest rehabilitation medicine registry in the world, Khan said, and recently began collecting data on ambulatory care. She shared that there are many opportunities to reduce variation and standardize the community care process, such as leveraging advocacy associations for diagnosed diseases (e.g., the Multiple Sclerosis Society) that develop clinical guidelines, building cohesive team structures and community supports, such as physiotherapists in local gyms who receive specific training for working with those recovering from spinal injuries, and generating timely accessible actional information through electronic medical record and patient journey boards. Community-based organizations provide wellness programming, she said, and options are expanding for integrating technology across the rehabilitation care continuum (e.g., wellness apps, cybernetics, artificial intelligence, and telehealth).

Khan cited several studies demonstrating that prehabilitation can improve health outcomes for high-risk patients during post-operative recovery. Prehabilitation involves meeting with behavioral therapists, physiotherapists, occupational therapists, and others to prepare for recovery from treatments. This strategy provides preventive services for patients with high-level risk factors, such as major surgery or high-risk procedures for lung, colorectal, gastrointestinal cancers, and abdominal surgery (Assouline et al., 2021; Lambert et al., 2021; Rosero et al., 2019; Waterland et al., 2021).

Rehabilitation as a Health Strategy for All Populations

Elias Mpofu discussed how to reorient rehabilitation as a health strategy, and how to see *capabilities* as opportunities in people's lives. Capabilities are a means for people to influence what happens in their lives, and by addressing capabilities, rehabilitation can be used as a health strategy to empower healthy aging.

Reorienting approaches to rehabilitation must consider the context of people's life situations, he explained (see Figure 8). Health systems often focus on symptom relief, or "ameliorative change" (the innermost ring in Figure 8), but that does not account for other domains of a person's life that

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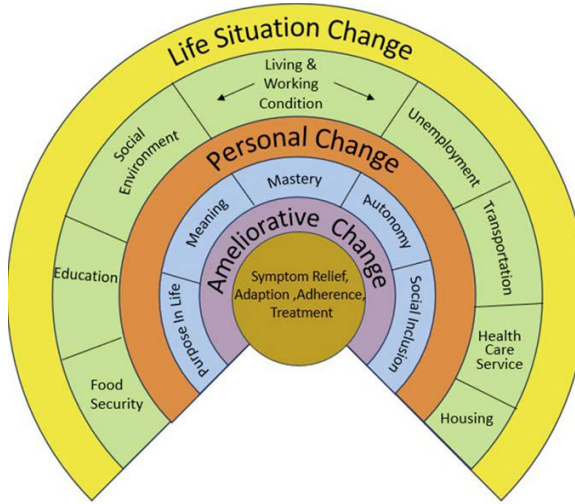

FIGURE 8 Life situations drive people's health function.
SOURCES: Presented by Elias Mpofu, February 16, 2024; Mpofu, 2024.

impact health status, such as work, family, and education, or their interaction with services. Mpofu also emphasized the impact of health disparities, and how people access and use health services. Preventive care can address not only people's health conditions but also their life situations by helping them with personal goals and development. He advocated for a social justice approach, with the goal of influencing individuals, the role of social systems in their lives, and society at a broader level.

Rehabilitation needs to be reimagined as oriented toward the whole life, with a health strategy that includes counseling, stewardship, advocacy, and more (see Figure 9). He referenced work by Stucki and colleagues on this topic (Stucki and Bickenbach, 2017, 2019; Stucki et al., 2019) and added that he believed community public health is the future of aging and functioning.

Panel Discussion

In discussion following the panelists' presentations, Leonardi asked about the government or society's responsibility when people may not have the strength to speak for themselves. Mpofu responded that guardianship issues vary by jurisdiction, and each panelist discussed the benefits of helping people plan ahead (e.g., using advanced care directives), especially when they receive a diagnosis that will likely lead to the inability to speak for themselves in the future.

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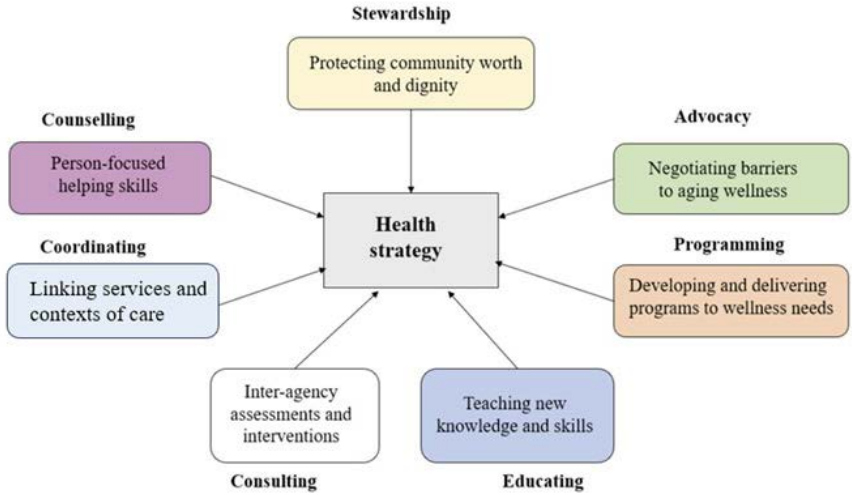

FIGURE 9 Reimagined whole-life-oriented rehabilitation strategy.
SOURCES: Presented by Elias Mpofu, February 16, 2024. Mpofu, 2024.

Keith asked panelists to address the social determinants of physical functioning. Mpofu urged a holistic approach, and not partitioning people according to medical specialties. Morsch said that all stakeholders should be included and that a multisectoral approach will be very helpful. Khan said she's observed areas with limited economic resources produce "really good outcomes," and that "it's really about how you tailor your service delivery to match the needs of the person in the community." Roxanne Maritz, University of Lucerne, described cutoffs in rehabilitation services in many health systems for those who pass a working age. Given that context, she asked Khan how to sustain rehabilitation services for the aging population. Khan identified that cutting off services in this way is a form of ageism but stated that some health systems, such as Melbourne's, have rehabilitation services for adults of all ages. Carla Sabariego, University of Lucerne, asked why the term *rehabilitation* is not included in the ICOPE description or featured in PAHO's implementation strategies. Morsch replied that rehabilitation is considered part of integrated care. Khan added that "you can't just box rehabilitation into a tiny area. It's huge . . . the preventative, the health promotion elements, the prehabilitation elements in the community right through to triaging in the community." Mpofu agreed, adding that a broader view of rehabilitation is more sustainable and allows for greater empowerment.

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Reflections on Developing Health Services for Rehabilitation and Functioning

On the second day of the workshop, Keith presented on the points discussed by the health services breakout group.[34] She explained that two major themes emerged from this discussion: (1) physical functioning maintenance and care within the health system and community settings, and (2) early screening assessments for older adults who appear to be functioning normally. Older adults who are functioning normally are not typically screened for changes in functioning or fall risks, but this monitoring is an important opportunity to intervene before extensive health care services are necessary, she explained.

Participants in the breakout group discussed promising areas for the future, including assessment instruments that are consistent across care and community settings, and expanding the availability of prehabilitation and rehabilitation in primary and long-term care, Keith said. Rehabilitation professionals need to be part of an integrated health care team, including in underserved areas, and rehabilitation needs to be person-centered and account for the specific needs of the patient's physical and social environment, including whether or not they have pre-existing conditions. She added that assistive technologies should also fit the needs of the person.

Marija Glisic, Swiss Paraplegic Research (Switzerland), asked how to address cultural considerations, as decline and death in the older population are to be expected and even doctors have low expectations in some countries. Keith referred to Eleanor Simonsick's phrase, the "tyranny of low expectations," and said that "we have to call out [ageism] when we see this in social media and other kinds of popular media, when we hear people disparaging themselves because they're older adults. That has to all change."

Seijas agreed that ageism is an issue in the criteria clinicians use to determine whether "a person is worth the effort" of receiving rehabilitation, and said this bias can appear in many areas, including insurance policies. Keith responded that a trio of challenges relate to ageism in rehabilitation: beliefs about whether the patient *can* do the rehabilitation, beliefs about whether the patient *will* do the rehabilitation, and the question of whether providers trust facilities enough to refer their patients to them.

Frontera mentioned that almost all of those who would benefit from rehabilitation live at home in their communities, not in rehabilitation units or acute care hospitals. Given this, Leonardi and Keith discussed how to delineate rehabilitation services. Leonardi said that payment systems need

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to identify which professionals are providing rehabilitation, and Keith emphasized that rehabilitation affects "a multitude of health outcomes, not just body function."

FUNCTIONING AS THE FOUNDATION FOR HEALTHY LONGEVITY RESEARCH

Julia Patrick Engkasan, Universiti Malaya (Malaysia), moderated the workshop's fourth panel on how measuring functioning can form a foundation for healthy longevity research. Engkasan described the challenge of designing and executing research that "captures the full lived experience of health." She added that the research ecosystem needs to be "prepared and primed" to undertake the multifaceted concept of functioning.

Harmonizing Research Addressing Functioning

Jonathan Bean, Harvard Medical School (United States), presented on how the aging and geriatrics field responded to the ICF framework, important initiatives in aging and rehabilitation, and ways to harmonize strategies moving forward. The ICF framework was initially met with debate and hesitancy to adopt the model fully in the field of geriatrics and gerontology (Guralnik and Ferrucci, 2009), especially in countries like the United States (Jette, 2009). The primary concerns were that ICF was redefining the concept of disability and that there was a lack of clarity about the border between activities and participation (Freedman, 2009). This ambivalence and sometimes ignorance around applying ICF continues today, said Bean, which is why communicating in a common language is key.

Frailty, defined as a "state of increased vulnerability to stressors caused by decreased physiologic reserves" (Fried et al., 2004, p. 256), is a powerful tool for stratifying older adults and adverse health outcomes. It is relevant for rehabilitation as it addresses the ability to withstand and recover from stress. Bean explained that despite much debate (Costenoble et al., 2021), frailty can be a useful concept for approaches and discussions related to function and disability (Fried et al., 2001; Rockwood et al., 2005).

Bean described two ongoing initiatives to support aging and rehabilitation. The Age-Friendly Health Care Systems Initiative recognizes that given the growing aging population, there are not enough geriatricians to go around.[35] The initiative seeks to help non-geriatricians to think like geriatricians and uses the 4Ms Framework to teach best practices for care of older adults in a patient-centered care approach (see Figure 10).

[35] See https://ihi.org/agefriendly (accessed May 10, 2024).

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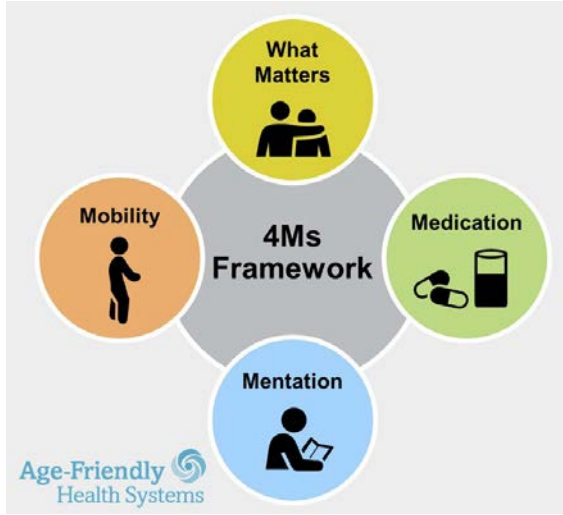

FIGURE 10 The 4Ms Framework.
SOURCE: Presented by Jonathan Bean, February 16, 2024; Institute for Health Improvement, n.d.

The Research Treatment Specification System,[36] a theoretical framework that can improve research intervention reporting (Van Stan et al., 2019), recognizes the problem of lacking standardization in rehabilitation research. Sometimes referred to as a "black box of rehabilitation," a lack of standardization in research methods can mean the active ingredients that make an intervention work remain unknown.[37] It is important to operationally define the contents of care, Bean continued, so clinicians can understand which approach may be best for their patients. This helps them avoid a "machine gun" approach, where the clinician tries to treat all the different deficits at once, he explained. The Research Treatment Specification System treatment theory focuses on what clinicians can do to support functional change and how they can include the active ingredients needed for rehabilitation treatments to expand the evidence base for those treatments. Treatment theory defines a mechanism of action and the outcomes

[36] See https://acrm.org/acrm-communities/rehabilitation-treatment-specification/manual-for-rehabilitation-treatment-specification/ (accessed May 20, 2024).

[37] As defined by the Research Treatment Specification System, "active ingredients" are the attributes of a treatment selected or delivered by a clinician that are hypothesized to exert the treatment's effect on a patient. For more on this system, see https://acrm.org/acrm-communities/rehabilitation-treatment-specification/manual-for-rehabilitation-treatment-specification/ (accessed May 10, 2024).

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that are directly linked to that mechanism, which reflects the ICF model, he explained.

Bean concluded by saying we need to harmonize concepts and to identify ways to bridge concepts on functioning and rehabilitation that advance research, so as not to repeat the miscommunications and misunderstandings in geriatrics and gerontology that occurred when the ICF was initially introduced.

Standardized Collection of Functioning Information

Birgit Prodinger, University of Augsburg (Germany), discussed the challenges and opportunities in the standardized collection of functioning information for research in rehabilitation and healthy longevity. She explained that functioning information is collected using various tools and at various levels, including micro (patient and provider interaction), meso (service provision and payment), and macro (planning, implementing, and evaluating policies and programs) levels and available through clinical, cohort, and population studies, as well as administrative and clinical data. A challenge in data collection is the comparability of the data. While some measurements of body function and structure can be converted easily (e.g., feet to centimeters), information collected about activity and participation are more complex to translate, which challenges comparability. Prodinger described three instruments for assessing mobility that address similar concepts from different perspectives: Can you walk 500 meters on a flat surface without an aid or assistance? Are you able to walk outdoors on flat ground? How well are you able to get around, and how satisfied are you with your ability to perform your daily activities? The first question centers on intrinsic capacity, the second addresses a person's actual daily life performance, which may include the use of assistive devices, and the third is a subjective appraisal of the person's own ability to do the activity and their satisfaction regarding the activity.

Not only is conceptual equivalence (i.e., that instruments or items are measuring the same concept) needed for comparability but there also needs to be metric equivalence (i.e., that numerical measures or scoring align), she explained. For example, a 3 on the WHO Disability Assessment Schedule indicates moderate problems,[38] but a 3 on the 36-Item Short-Form Health Survey indicates severe problems. Solutions for comparability challenges, she said, include standardizing data collection as well as reporting. Stan-

[38] World Health Organization Disability Assessment Schedule is a generic assessment instrument to provide a standardized method for measuring health and disability across cultures. See https://www.who.int/publications/i/item/measuring-health-and-disability-manual-for-who-disability-assessment-schedule-(-whodas-2.0) (accessed May 10, 2024).

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dardizing data collection requires changing practices, which may result in losing comparability with previously collected data. Unifying reporting requires agreeing on standards for reporting functioning information, including developing a conversion factor. A benefit to this approach is that it allows researchers to continue using existing data collection tools, which enables comparability over time, she added. However, she advocated for using both approaches, and mentioned ClinFIT as an example for standardizing data collection and the ICF Standardized Assessment and Reporting System for standardizing reporting.

Prodinger outlined three characteristics of functioning that are of value in rehabilitation but also present challenges for researchers. (1) Functioning is multidimensional, and all dimensions need to be assessed. She noted that ICF core sets can guide researchers in thinking about all dimensions when collecting information. To illustrate the importance of assessing all the dimensions, Prodinger expanded on a study that sought to expand documentation on spinal cord injury which found that in the acute phase the focus is on body functions and structures, with limited focus on activities and participation or environmental factors, whereas in the early long-term setting, body functions are the least important (Pongpipatpaiboon et al., 2020). (2) Functioning is interactive, and lived health is an outcome of the interaction between a person's capacity and the environment in which they live. Thus, it is necessary to collect the information on the environmental factors to understand disablement and enablement processes. (3) Functioning is continuous, and changes in functioning need to be interpreted throughout the rehabilitation process, as people enter rehabilitation at different levels of functioning and their functioning changes over time. More research is needed to understand the minimal clinically important difference of such changes, or the smallest change or improvement in a treatment outcome that a patient would identify as important, because that information can inform interpretability to inform regulatory and financing decision making, she explained. Prodinger concluded by saying that functioning, as the main outcome of rehabilitation, uniquely positions rehabilitation as a health strategy at the intersection of various disciplines. But we need to have the information about people's functioning in order to support rehabilitation as a viable health strategy.

Using Functioning Data for 360-Degree Research

Jan Reinhardt illustrated how to operationalize functional data and research in an ongoing trial in China. He explained that many OECD countries face growing health care spending with only marginal improvements in outcomes (OECD, 2023; World Bank and WHO, 2019). China is establishing new payment models similar to those of the United States wherein cost

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

estimates are independent of improved health. In a health system, reduced costs up front may lead to greater costs elsewhere (e.g., follow-up treatment episodes) because lower-cost care does not necessarily yield better health outcomes. He explained that a better approach is to integrate functioning as a core indicator in the payment system for baseline health, treatment targeting, and outcomes, which enables a payment system that improves health.

Reinhardt and his colleagues are seeking to develop a performance-oriented payment system for rehabilitation. Using data from a multicenter cohort study at 11 hospitals in China and an ICF-based metric from the rehabilitation set, they found that only 615 of the 2,020 patients improved meaningfully[39], which affects estimated costs for the population as total inpatient rehabilitations costs increase for patients who experience no improvement or worsening outcomes Then, they used a cluster-based approach based on 17 ICF categories to stratify the population into three groups, whereby costs for improvement aligned with baseline functional status at entry: mild, moderate, and severe[40]. Using a machine learning approach, the team identified a support vector machine model that can predict average costs and is now considering how to use this model to develop performance-oriented payment algorithms and incentives for patient improvement. Although the study's analysis remains preliminary, he drew several conclusions: meaningful improvement of functioning will require more investment than the current average; baseline functioning is an important predictor of costs within a diagnostic group; key performance indicators drawn from functioning information can be used for benchmarking and performance-oriented payment components; and using functioning as a core indicator enables payment systems to offer rewards for improving health.

Panel Discussion

During the discussion, a participant asked how to advocate for functioning as a priority when some members of a health team may not think of themselves as part of a rehabilitation team. Bean replied that the age-friendly health systems have it right because functioning is shown in research to usually be the primary concern for individuals seeking care; providers may need to be educated about how to measure functioning and how it is

[39] Meaningful improvement was measured by whether patients scored above the minimal important difference, which is the smallest change or improvement in a treatment outcome that a patient would identify as important.

[40] The ICF classification system uses qualifiers to assess the extent of functioning or disability and using a scale determines how much a factor is a barrier or facilitator, e.g., 0—no barrier; 1—mild barrier; 2—moderate barrier; 3—severe barrier; 4—complete barrier. See https://www.cdc.gov/nchs/data/icd/icfoverview_finalforwho10sept.pdf

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

conceptualized. He reiterated that work is needed to communicate about ICF outside its field. Prodinger noted that using the ICF as a frame of reference to link existing clinical research data conceptually and metrically could be a good approach, though access to the data may be a mitigating factor.

A workshop participant asked how to bridge the gap between research and practice. Bean brought up the opportunity to work with implementation researchers under the health services umbrella and said implementation research can shed light on how interventions should be packaged and which ones are truly effective. Glisic asked about the dichotomy between the need for standardized rehabilitation interventions to improve "the black box of rehabilitation" and the emerging development of personalized rehabilitation strategies, such as assistive devices. Bean replied that in order to show the efficacy of a treatment, it is critical "that we understand what the contents of that treatment are." Reinhardt countered that the black box may serve to return decision-making power to clinicians.

Simonsick restated her concerns about the "tyranny of low expectations," pointing out that rehabilitation is expected to raise patients' abilities to a level that most people would still consider disability and called for developing a way to "capture function that isn't about loss or incapacity, but also considers levels of actual capacity." Bean agreed and said that we need measurements that reflect a broad range of capacity, especially for the aging population. He added that basic continuous measures, such as gait speed, are a powerful predictor even among younger people, though context is important.

Reflections on Developing a Research Agenda for Functioning

On the second day of the workshop, Engkasan shared the discussion of the breakout group on research.[41] She presented the idea of establishing human functioning sciences as a new field, using the examples of bioinformatics, digital health, and evidence-based medicine as precedent. Creating a distinct discipline would facilitate broader participation from stakeholders outside the rehabilitation field, such as universities, hospitals, professional rehabilitation organizations, and those developing assistive technology, she asserted.

Participants in the breakout group also discussed using ICF as a reference system for developing standardized reporting and assessment tools but stated that curriculum and education on operationalizing ICF is needed because many methods currently in use lead to low-quality evidence. Rein-

[41] This section describes the discussions that occurred during a breakout session. Statements, recommendations, and opinions expressed are those of individual participants and should not be construed as reflecting any group consensus.

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hardt added that education and training are also needed on best practices for human functioning research. Engkasan reported that the group lacked sufficient time to discuss how to ensure that all the building blocks of the health system (see Figure 2) are researched appropriately.

Keith asked how to get health systems to cooperate with researchers by sharing data when they are disincentivized to do so because of competition among themselves. Reinhardt said that observing how health systems research is implemented in other countries may help, and some international groups have ongoing work to discuss how payment systems work in different countries. Additionally, he cited work on indicators for implementing the United Nations Convention on the Rights of Persons with Disabilities.

Hajjioui asked how research can be translated into health policy, guiding advocacy groups, educators, and policymakers. Engkasan responded that the research breakout group discussed collaborating with existing organizations to disseminate research findings and emphasized training researchers on moving beyond publication to disseminate their findings by becoming visible in the media and writing policy briefs.

ADVOCATING FOR POLICIES THAT SUPPORT HEALTHY LONGEVITY

Leonardi introduced the final panel, citing Nietzsche's idea that vigorous health can only be properly understood from the viewpoint of fragile health. She added that the aftermath of the COVID-19 pandemic—a time of global fragile health—has enabled people to appreciate vigorous health as a common good. Furthermore, building "collective intelligence" about functioning provides an opportunity to contribute to the common good. Panelists presented on advocacy efforts and tools for bringing research findings to policymakers and others.

Advocating for Functioning as the Third Indicator of Health

Dorothy Boggs, London School of Hygiene and Tropical Medicine (United Kingdom), presented on challenges and opportunities of advocating for functioning as the third indicator of health and focused on population-level functioning, rehabilitation, and assistive products (e.g., hearing aids, glasses, walking aids). Boggs noted that approaches for measuring functioning need to include both self-reporting and clinical assessments, which will require simplified messaging and explanations using ICF. She identified a research gap for a multidomain survey assessment tool that combines both self-report and clinical assessments, including functional assessments, to measure functioning and the need for rehabilitation and assistive products (Boggs et al., 2021a).

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Hybrid tools can use technologies, such as artificial intelligence, to shorten assessment times and incorporate all six ICF components (see Figure 2). An example of a hybrid multidomain tool is the Functional Needs Assessment Tool (FNAT), developed in collaboration with the Assistive Technology 2030 research consortium.[42] FNAT is a population survey method for identifying needs for services, such as rehabilitation, and assistive products, such as glasses and hearing aids as it is estimated that 2.5 billion people worldwide would benefit from assistive products (WHO, 2022c). FNAT uses a mobile app and is built using existing survey tools, such as the Washington Group Extended Set on Functioning[43] and rapid survey methodology developed by the London School of Hygiene and Tropical Medicine for vision, hearing (Bright et al., 2019), and mobility (original tool, Atijosan et al., 2007; updated in Boggs et al., 2021b).[44] The tool was field tested in Kalugu, Uganda, in 2023.

Boggs asserted that tools such as FNAT are needed to improve the metrics available for planning rehabilitation, assistive products, and more, and these data can help build the economic case for functioning. The economic case can also reassess how to value health and well-being, including the cost of inaction. For rehabilitation, more economic research is available from high-income countries than from low-income countries, and that research typically focuses on cost benefits and cost-effectiveness related to specific conditions (e.g., cost benefits of rehabilitation from a stroke) (Mills et al., 2017). For disability, existing research tends to focus on the harms and costs of disability, but shifting to a positive focus could include looking at the cost benefits of social assistance programs that help people with disabilities return to work, she explained. For assistive technology, Boggs used the example of the Global Partnership for Assistive Technology ATscale case study, which demonstrated a nine-to-one return on investment, identifying four assistive products as priorities: hearing aids, prosthetics, eyeglasses, and wheelchairs. ATscale presents benefits in different sectors, including the economic, social, and education sectors, and at user, family, and society levels (ATscale, 2020; see Figure 9).

[42] See Global Disability Innovation Hub, *AT 2030: Life Changing Assistive Technology for All*, https://www.disabilityinnovation.com/at-2030 (accessed May 10, 2024).

[43] The Washington Group Extended Set on Functioning is a series of questions developed by the Washington Group on Disability Statistics intended for use in population-based health surveys and surveys on disability. It obtains information on difficulties a person may have in basic functioning activities. See https://www.washingtongroup-disability.com/fileadmin/uploads/wg/Washington_Group_Questionnaire__2_-_WG_Extended_Set_on_Functioning__October_2022_.pdf (accessed May 10, 2024).

[44] See International Centre for Evidence in Disability and PEEK, *Rapid Assessment of Avoidable Blindness (RAAB)*, https://www.raab.world (accessed May 10, 2024).

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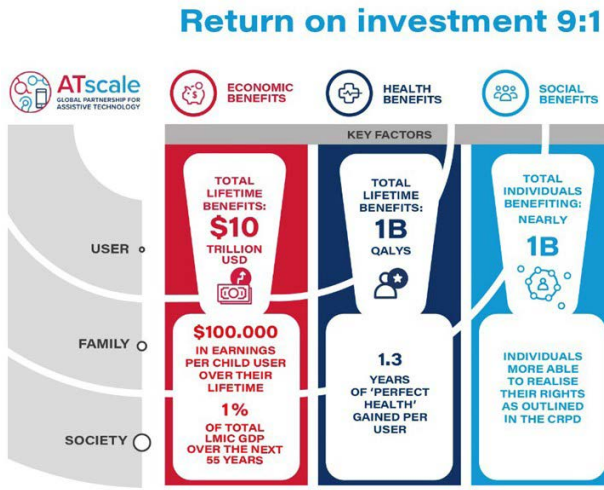

FIGURE 11 Assistive technology demonstrates a nine-to-one return on investment.
NOTE: CRPD = United Nations Convention on the Rights of People with Disabilities; GDP = gross domestic product; LMIC = low- or middle-income countries; QALY = quality-adjusted life-year.
SOURCE: Presented by Dorothy Boggs, February 16, 2024; ATscale, 2020.

Boggs discussed challenges and opportunities for building the economic case for functioning, including lack of economic data and limited return-on-investment research, for targeting multisectoral and interdisciplinary approaches, and for focusing on populations with the most need, such as the aging population. Boggs concluded by proposing next steps to achieve "functioning for all," including decreasing measurement gaps by strengthening survey measurement tools and economic research. These need to include user-led groups, such as organizations for disabled or older adults, as well as case studies.

Raising Awareness: The Policy Advocate Perspective

Ruth Katz, Association of Jewish Aging Services (United States), discussed the importance of ensuring people's goals are integrated into programs, provided examples of how programs should incorporate functioning, and explained how different programs are financed. Many policies are not informed by evidence despite the existing data, she explained, and policies for health care and rehabilitation in the older population are often do not match their needs and preferences. Maintaining quality of life matters to people, said Katz, and among older adults, mobility, independence, and

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

mental health are high priorities. Adults older than 65 are a heterogenous group and may have different goals, but they typically end up in the same financing programs, where all receive the same services. Katz also said that for different populations, rehabilitation can serve different purposes, such as restoring functioning and independence or improving a person's functioning so that they can return to work.

Care planning for older adults includes diagnosis and functional assessment, and it is supposed to be based on the individual's preferences or goals. Although these goals vary among individuals, older adults tend to receive therapies or programs based on broad groupings. Programs are sometimes based on irrelevant or ill-fitting policies, she explained. Adult day service programs in the United States, for example, must follow specific guidelines (such as supporting people at their highest level of functioning) to receive Medicaid funding and might include career services or interactive outings.[45] These programs might benefit people who are still actively seeking work but are not well suited to the needs or abilities of older adults with dementia. Katz concluded by discussing how policy programs are often disconnected from each other and said that financing for long-term care is especially lacking in the United States for people with middle-level incomes.

New Directions for Health and Disability

Abderrazak Hajjioui presented on how different approaches to advocacy efforts to improve functioning and overall health. Defining the concepts of health, rehabilitation, and functioning in a straightforward manner is key with policymakers and stakeholders, and he emphasized how prevention and emergency response can be avenues for advocacy. The WHO defines *health* as a holistic state of well-being, not just the absence of disease, and includes other factors such as access, support for education, and improved environmental conditions.[46] Hajjioui said the goal of health interventions is improving function. The COVID-19 pandemic, which significantly increased mortality and restricted participation and functioning, required government response and mass health interventions in both prevention and treatment. He added that framing functioning in terms of acute medicine and return to work has been a successful strategy when communicating with policymakers.

[45] Medicaid is a U.S.-funded program that provides free or low-cost health care to low-income people, families and children, pregnant persons, older adults, and people with disabilities.

[46] The WHO defines *health* as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The WHO constitution includes several of principles of increased and sustained access and health promotion. See https://www.who.int/about/accountability/governance/constitution (accessed May 10, 2024).

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Hajjioui said there are different entry points for advocacy and asserted that advocacy starts with education "because the students of today will be the leaders and policymakers of tomorrow." Advocacy approaches need to consider stakeholders' contexts and perspectives. Governments need to know about human rights approaches, wherein the objectives are dignity and autonomy and increased access. Private institutions want to understand the economic impacts, such as cost-effectiveness and workforce productivity. Consumer organizations respond well to a person-centered approach, with holistic care, empowerment, and engagement, while academic institutions tend to prefer public health approaches, such as prevention and community-based programs. He noted that DALYs can be used to show the value of rehabilitation in improving years lived with disability (see Figure 3). Within the rehabilitation field, advocates should consider prevention (e.g., preventing falls and risk for chronic illnesses), primary prevention through treatment (i.e., beginning rehabilitation at the time of diagnosis), and secondary and tertiary prevention through improving people's environments and removing barriers to care. He concluded by emphasizing the importance of communicating with policymakers that "it's time to end the global neglect of rehabilitation."

Panel Discussion

Keith, asked who, in addition to health economists and policymakers, should be part of an advocacy team. Katz replied that such teams can include family members, individuals who use care services, students, advocacy organizations, and boards of organizations. Boggs reiterated that user-led organizations such as those for people with disabilities or for older adults are important.

A workshop participant asked about the gap between aging and rehabilitation in developing countries, stating that one cannot assume the association between the two is automatic, and asked what steps could be taken from an advocacy perspective. Hajjioui agreed that this is a problem in low- and middle-income countries, and that work is needed to educate professionals in the acute medicine workforce (e.g., internal medicine, geriatrics, neurology). Boggs responded that her LMICs research has revealed that older adults have a higher prevalence of need, and more data will help demonstrate this. Pacheco emphasized the need for data to show the economic value of rehabilitation. Gimigliano added that it is important to advocate for rehabilitation as an investment to improve functioning rather than another health expense.

Sara Rubinelli, University of Lucerne, stated that although some suggest that functioning and rehabilitation are fuzzy concepts, clearer definitions are now available. Boggs responded that while the concepts are clear

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to those in the room, they can be overwhelming for audiences unfamiliar with frameworks such as the ICF. Boggs added that case studies are key to communicating effectively, recalling Hajjioui's example of a well-known athlete's injury, subsequent rehabilitation, and improved performance. In fact, she said, in discussions over lunch during the workshop, participants quickly resorted to tangible examples from their own families, reinforcing the utility of case studies as communication strategies. Hajjioui added that advocacy for functioning is challenging because of the low levels of knowledge and education about the concept, so education is a critical component.

Reflections on Promoting Advocacy for Functioning and Rehabilitation

Leonardi said that her breakout group discussed how, for many countries, rehabilitation is not embedded in the health care system as well as other strategies such as prevention, promotion, diagnosis, and palliative care.[47] Raising awareness is needed first, she said; the issue of rehabilitation and functioning needs to be clear at all levels of policy, and case studies and identifying clear problems and solutions will help. She underlined the term *biopsychosocial model* as part of communications around functioning, which she said has "a bit disappeared."

Leonardi said that functioning implies coordination between services along a continuum of care across the lifespan. However, most of the strategies for noncommunicable diseases don't include strategies about rehabilitation or functioning. Participants from the breakout session also discussed opportunities for collaboration. Some suggested that WHO should embed functioning and rehabilitation in all its programs and argued that the World Rehabilitation Alliance should consider supporting the concept of functioning, not only address deficits and impairments. Leonardi stated that the United Nations Convention on the Rights of People with Disability, which she described as a "Trojan horse," has been endorsed by 192 countries, and its Article 26 could be used to support the introduction of rehabilitation.

Chatterji suggested that advocacy might best be accomplished by communicating the instrumental value of functioning insofar as it enables people to do what they want to do and thereby enhances well-being, rather than discussing intrinsic value alone. Leonardi agreed but also mentioned that different countries value the aging population and people with disabilities in different ways.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

WRAP-UP

The last session of the workshop featured the three keynote speakers, who contributed final remarks and reflections on the panel and breakout discussions. Jerome Bickenbach reiterated the importance of conceptual clarity. He stated that conceptual clarity is foundational for avoiding "agreement by misunderstanding" and is needed because of how the meaning of functioning and rehabilitation are used different based on their context. Conceptual clarity is not *just* semantics, he asserted; in fact, he said, "semantics is all we have." Somnath Chatterji warned against conflating *description*, which is value-neutral, and *appraisal*, which describes societal value. In order to disentangle improving capacity versus performance, he said, an outcome of interest must be identified, which may be considered improving well-being.

Bickenbach addressed barriers for implementation and scaling up interventions. Some challenges include what he described as "proxy fetishization"—proxies merely approximate phenomena, but the actual thing being measured gets lost. He gave the example of quality of life, which he described as a collection of unrelated and random items with no concrete content. These challenges aside, he said, direct measurement is possible. A second barrier for implementation is institutional inertia, wherein institutions have vested economic and other interests that need to be accounted for. These paradigms are not easy to move, and implementation will not likely go smoothly.

Bickenbach supported the need for involving multiple sectors, as stated by several panelists. While functioning is always considered in the context of a health condition, approaches to optimizing functioning (e.g., putting in a ramp) will involve other sectors. Proof-of-concept demonstrations will also move the field forward. Bickenbach raised the issue of whether it is possible to create trajectories over the life course to optimize capacity and performance using environmental improvements, and whether the focus should be on increasing interventions across the lifespan to address capacity or on the "huge repertoire" for improving performance (e.g., antidiscrimination laws, ramps). Ultimately, he asserted, the question for the field will be which is more achievable: a healthy aging agenda or on making the world more accessible and a better place to live.

John Beard reiterated Bickenbach's point about relying too heavily on proxies and said that while social determinants of health often arise in discussion on noncommunicable diseases, there are social determinants of performance as well. He also said that while the ICF is valuable as a classification system, the field lacks "plug-and-play" tools at both the population and clinical levels. He added that tools need to be developed with the

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changing world in mind, such as for health information technology and using smartphones to determine gait speed.

Beard raised two ways capacity and rehabilitation might be deployed in practice: there is an ICD code—age-related declines in intrinsic capacity—that can be used for measurement and to drive research. Additionally, rehabilitation is embedded into the ICOPE model, which could be used as a platform in the future. Beard next addressed the idea of creating a specific discipline for human functioning sciences. He stated that it is time to be assertive and take advocacy to the next level, looking at the world not only through the lens of disease.

Alarcos Cieza described the tension between functioning as a public health agenda and rehabilitation as clinical care, as they are currently considered separate agendas. Public health is about the whole population, while rehabilitation is about clinical care for people who have reduced functioning, she said. Rehabilitation can have public health relevance, because of the 2.4 billion people who could benefit from it. But, she said, it is better to see these as separate agendas. Moving back and forth between the two reduces conceptual clarity and forward movement, she stated, adding that people promoting healthy aging do not want to be cornered with the rehabilitation sector: "Don't put me into that clinical box." Cieza added that human functioning sciences should be the top level, and rehabilitation can contribute to that agenda. She asked how to incorporate functioning in a post–Sustainable Development Goals agenda and emphasized the importance of cross-sectoral collaborations.

Beard agreed with Cieza that the relationship between rehabilitation and functioning relate needs to be defined and emphasized that now is the time to reframe competing agendas. Beard also mentioned that human ability is changing with advances in science. Stucki remarked that it is time to seize the moment to establish functioning as a core concept relevant to population health, aging, and rehabilitation. Frontera encouraged thinking outside the box—or expanding the box. Not everyone is comfortable with change, he said. He closed with a quote by Albert Einstein: "The measurement of intelligence is the ability to change."

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Appendix A

Statement of Task

A planning committee of the National Academies of Sciences, Engineering, and Medicine will organize and host a one-and-a-half-day public workshop that will facilitate a discussion focused on the World Health Organization's concept of functioning and its role in rethinking the concept of health, with a focus on healthy aging and the future of rehabilitation as a health strategy. The workshop will include presentations on: challenges in operationalizing function as a measure in health policy, rethinking disability as a universal human experience, and discussing a feasible public health agenda that addresses the increasing relevance of rehabilitation for the 21st century.

The workshop will feature invited presentations and panel discussions on topics such as:

- The World Health Organization's concept of functioning in the International Classification of Functioning, Disability and Health (ICF);
- Moving beyond traditional health outcome measures and operationalizing functioning as a measure of health;
- Standardizing and routinely collecting functioning data in health information systems;
- Ways to integrate functioning into public health strategies for healthy aging and healthy longevity;
- Disability from the perspective of functioning: a universal human experience as well as a discrete social group seeking equity;

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- Epidemiology of functioning: the consequences of using functioning as the third health indicator augmenting mortality and morbidity;
- How demographic and epidemiological projections are shaping the future of public health in the context of functioning;
- Conceptualizing and operationalizing rehabilitation as the health strategy that aims to optimize functioning, which could serve as the basis for scaling rehabilitation in the 21st century;
- Functioning and person-centered care: the lived experience of health;
- Functioning and value-based health care.

The planning committee will develop the agenda for the workshop sessions, select and invite speakers and discussants, and moderate the discussions. A proceeding of the presentations and discussions at the workshop shall be prepared by a designated rapporteur in accordance with institutional guidelines.

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Appendix B

Workshop Agenda

16–17 FEBRUARY 2024

LECTURE HALL 1

UNIVERSITY OF LUCERNE

LUCERNE, SWITZERLAND

FRIDAY, 16 FEBRUARY 2024 – DAY 1

8:30

Welcome and Workshop Overview
Walter Frontera, *Chair, Planning Committee*
University of Puerto Rico School of Medicine

Welcome by the U.S. National Academies of Sciences, Engineering, and Medicine
Victor Dzau
U.S. National Academy of Medicine

Welcome by the University of Lucerne and the Swiss Academy of Medical Sciences
Gerold Stucki
University of Lucerne

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	Bruno Staffelbach University of Lucerne
	Henri Bounameaux Swiss Academy of Medical Sciences
9:00	**Keynote: The Functioning Revolution** Jerome Bickenbach University of Lucerne
9:30	**Keynote: Healthy Longevity** John Beard Columbia University
10:00	**Keynote: World Health Organization's Perspective on Rehabilitation** Alarcos Cieza World Health Organization
10:30	**BREAK**
10:45	**Panel 1: Functioning and the Realization of Healthy Longevity through Rehabilitation** Moderator: Somnath Chatterji, World Health Organization, Emeritus, Planning Committee Member
	Operationalization of Functioning for Population Health Francesca Gimigliano University of Campania "Luigi Vanvitelli"
	The Role of Functioning in Healthy Longevity Research Eleanor Simonsick National Institute on Aging
	Implications of Tracking Functioning for Health Systems and Health Care Alan Jette Boston University
11:45	**LUNCH**

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12:45 **Panel 2: Functioning and the Investment Case for the Role of Rehabilitation in Healthy Longevity**
Moderator: Gerold Stucki, University of Lucerne, Planning Committee Member

Measuring and Enhancing Functioning in Health Systems
Paola Sillitti
Organisation for Economic Co-operation and Development

Making a Compelling Investment Case for Optimizing Functioning for Healthy Longevity
Carl Willers
Karolinska Institutet

13:45 **Panel 3: The Foundation for Improving Rehabilitation Service Delivery and Care across the Life Course: Continuity and Person-Centered Care and the Lived Experience of Health**
Moderator: NiCole R. Keith, Indiana University, Planning Committee Member

Rehabilitation as an Interprofessional and Transdisciplinary Health Strategy for Healthy Aging
Patricia Morsch
Pan American Health Organization

Integrating Prehabilitation, Prevention, and Maintenance to Maximize Functioning
Fary Khan
University of Melbourne

Reorienting Rehabilitation as a Health Strategy for All Populations in the Community
Elias Mpofu
University of North Texas, University of Syndey

14:45 **BREAK**

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15:00 **Panel 4: Functioning as the Key to a Comprehensive 360-Degree Life Course Foundation for Healthy Longevity Research**
Moderator: Julia Patrick Engkasan, Universiti Malaya, Planning Committee Member

Harmonizing Research Addressing Functioning within Aging and Rehabilitation Ecosystems
Jonathan Bean
Harvard Medical School, VA Boston Health Care System, Spaulding Rehabilitation Hospital, Massachusetts General Hospital

Challenges and Opportunities in the Standardized Collection of Functioning Information for Research in Rehabilitation and Healthy Longevity
Birgit Prodinger
University of Augsburg

Utilizing Functioning Data for 360 Degree Research: Using the Example of Prospective Budgeting and Performance-Oriented Incentive Mechanism for Insurance Payment for Rehabilitation Episodes based on WHO's International Classification of Functioning, Disability and Health
Jan Reinhardt
Sichuan University, Jiangsu Province Hospital, University of Lucerne

16:00 **Panel 5: Advocating for Health and Social Policy in Support of Healthy Longevity: Functioning as the Third Indicator of Health**
Moderator: Matilde Leonardi
IRCCS Foundation "Carlo Besta" Neurological Institute, Planning Committee Member

The Challenges and Opportunities of Advocating for Functioning as the Third Indicator of Health
Dorothy Boggs
London School of Hygiene and Tropical Medicine

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The Policy Advocate Perspective: Raising Policy Awareness and Championing Communications related to Functioning
Ruth Katz
Association of Jewish Aging Services

New Directions on Health and Disability
Abderrazak Hajjioui
Sidi Mohamed Ben Abdellah University

17:00 **ADJOURN DAY 1**

SATURDAY, 17 FEBRUARY 2024 – DAY 2

8:30 **Welcome to Day 2 of the Workshop**
Walter Frontera, *Chair*, Planning Committee

8:35 **Facilitated Breakout Sessions**
FUNCTIONING
Facilitator: Somnath Chatterji, World Health Organization, Emeritus, Planning Committee Member
Supporting Scientist: Nicola Diviani, Swiss Paraplegic Research
ECONOMICS
Facilitator: Gerold Stucki, University of Lucerne, Planning Committee Member
Supporting Scientist: Diana Pacheco, University of Lucerne
HEALTH SERVICES
Facilitator: NiCole R. Keith, Indiana University, Planning Committee Member
Supporting Scientist: Carla Sabariego, University of Lucerne
RESEARCH
Facilitator: Julia Patrick Engkasan, Universiti Malaya, Planning Committee Member
Supporting Scientist: Marija Glisic, Swiss Paraplegic Research
ADVOCACY
Facilitator: Matilde Leonardi, IRCCS Foundation Carlo Besta Neurological Institute, Planning Committee Member

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Supporting Scientist: Sara Rubinelli, University of Lucerne

9:30 **BREAK**

9:45 **Report-Backs from Facilitated Discussions and Workshop Reflections**
Moderator: Walter Frontera, *Planning Committee Chair*

Somnath Chatterji
World Health Organization, Emeritus

Gerold Stucki
University of Lucerne

NiCole R. Keith
Indiana University

Julia Patrick Engkasan
Universiti Malaya

Mattilde Leonardi
IRCCS Foundation Carlo Besta Neurological Institute

11:00 **BREAK**

11:30 **Next Steps for the Way Forward: Fireside Conversation with Discussants**
Co-moderators: Walter Frontera, *Planning Committee Chair*, and Gerold Stucki, *Planning Committee Member*

John Beard
Columbia University

Jerome Bickenbach
University of Lucerne

Alarcos Cieza
World Health Organization

12:50 **Closing Remarks**
Walter Frontera, *Chair*, Planning Committee

13:00 **MEETING ADJOURNS**

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Appendix C

Concept Notes

FUNCTIONING AND THE REALIZATION OF HEALTHY LONGEVITY THROUGH REHABILITATION

Concept Note, Panel 1

Context

The aim of this Workshop is to facilitate a discussion of the World Health Organization's concept of functioning as introduced in its International Classification of Functioning, Disability and Health (ICF), and to explore its role in rethinking the operationalization of health and its application to healthy longevity and the increasing relevance of rehabilitation as a key health strategy for the twenty-first century.

In the ICF, functioning includes the functions and structures of the body that constitute the intrinsic health capacity of a person as well as the actual performance of simple and complex activities in interaction with the person's physical and social environment. Conceptually, functioning comprises the domains of both biological health and lived health, where lived health is fully contextualized as an outcome of interactions between a person's intrinsic health capacity and features of their environment.

Across the lifespan, all of us may experience pain, anxiety, fatigue and weakness, tight joints, skin sores, and other sensory, mobility, and cognitive impairments. When these impairments affect our lives—when we cannot climb stairs painlessly, walk as far as we used to, clean or dress ourselves, read a book, make and keep friends, do all the homework we need to do,

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or perform our jobs—these concrete, real-life difficulties shape our lived experience of health. And this lived experience is what matters to us about our health; it's why we seek out health care in the first place. When we do not experience these difficulties, we are well advised to invest in health promotion activities to make us more resilient in functioning. In short, the notion of functioning creates a more meaningful operationalization of what health means to us.

WHO's concept of human functioning constitutes a new understanding and conceptualization of health with wide-ranging consequences, for aging and rehabilitation research, practice and policy.

Functioning constitutes a third indicator of health, augmenting the traditional indicators of mortality and morbidity. As the third indicator, functioning completes our intuitive sense of why health matters: avoiding premature mortality and controlling morbidity are clearly important to us, both individually and as members of society at large. But there is a third dimension that is missing to this picture, our everyday functioning and lived experience of our state of health. This is most clear in the case of population aging. As improved health care and other social improvements continues to add more years to our lives, it becomes equally important to add more life to our years.

As well as population aging, the increased prevalence of noncommunicable diseases—whose impact is primarily assessed in terms of changes in functioning—is a substantial public health concern, warranting increased investment in rehabilitation which aims to optimize functioning. These trends point to the need to prepare our health care systems by reorienting their focus to optimizing functioning through strengthening rehabilitation.

The operationalization of health as functioning helps to explain the contribution the health care system can make to individual well-being and societal welfare, providing as well a more robust foundation for our understanding of disability, as a decrement of functioning, and how we for health and social purposes assess disability.

Objective of the Panel

The objective of this panel is to prepare the ground for the Workshop by scrutinizing WHO's notion of functioning. The focus is conceptual and includes

A. The role of functioning as the third indicator of health in the operationalization of health for aging and rehabilitation research, practice, and policy.
B. Functioning as a robust and sound basis for the healthy longevity agenda, especially in ensuring that rehabilitation—the health strat-

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egy whose primary aim is to optimize functioning—can contribute to these goals.

C. The potential of functioning to capture what the health care system can contribute to individual well-being and societal welfare, in light of population aging.

D. The role of functioning for reorienting the notion of disability, especially for standardized, transparent and fair assessment for health and social benefits.

Questions for Discussion

1) What is the role of functioning in operationalizing health for measurement, the health sciences, practice, and policy—how can functioning as the third indicator of health be concretely implemented?
2) How can functioning in practice provide a robust and sound basis for the healthy longevity agenda, especially in ensuring that rehabilitation—the health strategy whose primary aim is to optimize functioning—can contribute to those goals?
3) How can functioning directly contribute to the explanation of the health care system's role in individual well-being and societal welfare?
4) How can functioning reorient our understanding of disability, especially for to achieve standardized, transparent and fair assessment of disability for health and social benefits?

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—Drafted by Jerome Bickenbach

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FUNCTIONING AND THE INVESTMENT CASE FOR THE ROLE OF REHABILITATION IN HEALTHY LONGEVITY

Concept Note, Panel 2

Context

This panel will show how expanding the focus on human functioning can bring enormous economic gains both to individuals and society at large. The focus on functioning emphasizes that people care about their health not just because of the stock of health they can accumulate but because of what they can do when healthy, that is, their functioning. In general, people with a wider range and more robust functioning are more independent and more able to actively participate in society, which has important implications for the financial stability of families, the economy, and health and social systems.

People are living longer—the product of the great success of medicine and technology—but they are also more likely to face chronic health conditions that limit their everyday lives. Increasing prevalence of chronic health conditions means more disability, which in turn creates economic challenges both for the individual and the rest of society. Not only do people facing disability require more care, support, and accommodation, but many must also limit their labor market participation. As these epidemiological and social trends continue, the increasing dependency and accommodation levels will bring significant financial constraints for individuals, their families, and the economy in general, with important effects on how our health and social systems are organized.

While expanding services and insurance coverage may be the first solution to cope with the changing needs of the population, the increasing health and social care costs will constrain the growth possibilities of societies. Therefore, a more proactive solution will be to fundamentally shift the policy focus from a limited one of treating health conditions to a more comprehensive measure of functioning. If successful, we will achieve a more productive and effective societal structure, more financially stable individuals and families, more dynamic economies, and more sustainable health and social systems.

Objective of the Panel

This panel discusses how recentering the focus of health and social systems to people's functioning can bring significant economic gains to society. This panel will take a societal perspective and will consider whether

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A. Targeting functioning translates into more active and participating citizens in the labor market, and the potential economic gains: this shift directly affects the labor supply, which is limited in industrialized economies.
B. Targeting functioning translates into a more independent population that relies less on the support, care, and accommodation from others: this shift will have important implications for the financial situation of individuals and their families.
C. Targeting functioning will result in healthier and more active people and contain the increasing health and social care expenditure: this shift will impact health and social cost and the sustainability of health and social systems in the long term.

Questions for Discussion

1) Demographic dynamics put disability at the center of public health. Therefore, how can we show health and social systems that what matters for society is functioning and not only health?
2) One of the main challenges for health and social systems is coping with the increasing needs of care in the population. Currently, long-term care is extremely expensive and available to only a small part of the population. How can we shift the focus of health and social systems toward functioning and not only expanding care services?
3) While health is important, what matters at the social level is that people be independent. Therefore, how can we incentivize the active measurement of other relevant outcomes, such as working status, in health and social care systems?
4) How can we expand the focus toward a more comprehensive understanding of human health in terms of functioning within the existing structure of health and social systems? Do health and social services need to adapt their information systems and their reimbursement and other financial arrangements in order to include indicators that allow us to measure functioning?

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—Drafted by Diana Pacheco

THE FOUNDATION FOR IMPROVING REHABILITATION SERVICE DELIVERY AND CARE ACROSS THE LIFE COURSE: PERSON-CENTERED CARE, INTEGRATED CARE PRINCIPLES AND THE LIVED EXPERIENCE OF HEALTH

Concept Note, Panel 3

Context

The overall aim of this workshop is to facilitate a discussion on how rehabilitation services, focusing on effective, accessible, integrated and person-centered care, can contribute to achieving the goals of the UN Decade of Healthy Ageing. As the main goal of rehabilitation is to optimize functioning, the concept of functioning provides the basis for achieving this goal and fully realizing the healthy longevity agenda.

Rehabilitation is recognized by WHO as one of its five health strategies in the Astana Declaration, in which member states committed to "meet the health needs of all people across the life course through comprehensive preventive, promotive, curative, rehabilitative and palliative care." Due to its importance in a world increasingly characterized by aging societ-

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ies and epidemic noncommunicable diseases, in 2017 WHO launched a specific agenda—WHO Rehabilitation 2030—calling on member states to strengthen health systems to provide rehabilitation to all people in need, including people with health conditions, the aging population and people with disabilities. Finally, access to rehabilitation is a human rights issue. The Convention on the Rights of Persons with Disabilities (CRPD) devotes Article 26 to rehabilitation, stressing the need to strengthen services and programs and access to assistive technology.

The global need for rehabilitation is profound. In 2019 a landmark article in *The Lancet* using data from the Global Burden of Disease showed that 2.41 billion people have health conditions that would benefit from rehabilitation. This represents one in three people worldwide, many of whom are older adults. The main health conditions associated with the needs of people over 65 are musculoskeletal disorders, neurological disorders, sensory disorders (hearing, vision), and chronic respiratory diseases. A Resolution on Rehabilitation was adopted by the World Health Assembly in 2023, emphasizing the need to strengthen rehabilitation into health systems worldwide.

The importance of giving rehabilitation a more prominent role in healthy longevity agendas has been well justified, especially to improve health and social support services and assistive technologies for the aging population. At the European level, scoping reviews and online consultations currently being performed under the auspices of WHO EURO will lead to an expert consultation on priority setting for strengthening rehabilitation services for healthy aging in Europe and a WHO EURO Regional Summit for National Policy Experts on Healthy Ageing in Lisbon in October 2023 focused on the United Nations goals as part of the Decade on Healthy Ageing. All these initiatives to strengthen rehabilitation, however, depend on concerted efforts to ensure changes and reforms to health systems to support rehabilitation and international aging agendas.

Objective of the Panel

The objective of this panel is to interrogate health systems in light of international healthy aging agendas and in particular the essential role that rehabilitation, as the health strategy whose aim is to optimize functioning, plays in healthy longevity and aging. The panel focuses on

A. the role of rehabilitation service delivery and care across the life course;
B. rehabilitation as a key WHO health strategy to achieve healthy aging;

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

C. the potential of health systems reforms to ensure that rehabilitation contributes to individual well-being and societal welfare, in light of population aging;
D. rehabilitation as a health strategy to all people in need, including people with health conditions, the aging population and people with disabilities.

Questions for Discussion

1) What is the role of rehabilitation service delivery and care across the life course for the health sciences, practice, and policy? How can rehabilitation as a health strategy be concretely strengthened in health systems?
2) How can rehabilitation as a key health strategy contribute to achieve a healthy longevity of populations worldwide?
3) What is the potential of rehabilitation to contribute to individual well-being and societal welfare in light of population aging, and how this should be communicated to policy makers?
4) How can we reorient our understanding of rehabilitation from a service exclusive to specific groups to a health strategy relevant to all people in need, including people with health conditions, the aging population, and people with disabilities?

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—Drafted by Carla Sabariego

FUNCTIONING AS THE KEY TO A COMPREHENSIVE 360-DEGREE LIFE COURSE FOUNDATION FOR HEALTHY LONGEVITY RESEARCH

Concept Note, Panel 4

Context

As functioning is a multifaceted concept, when used as the foundation for research into the lived experience of health, it is a challenge to capture in study design its complexity integrating different methodologies, measures, and perspectives that represent the biomedical, psychological, and social dimensions of functioning. This is not merely a matter of collaboration across disciplines, but also collecting comparable functioning information. While the International Classification of Functioning, Disability and Health (ICF) provides the framework for describing and organizing comparable functioning information, considerable work remains to develop standardized assessment and statistical analysis of functioning information, including harmonization across different data sources, clinical, cohort and population studies, and administrative data. Particularly challenging, given that functioning changes over time and across different environmental contexts, is assessing change longitudinally. This is especially important for aging studies when life events and the aging process itself influence trajectories of functioning.

Rehabilitation involves diverse populations with different health conditions, impairments, and health and health-related needs. This heterogeneity can make it difficult to generalize findings and develop universally applicable interventions. Because functioning is influenced by diverse contextual factors—from climate to interpersonal relations and attitudes to social and

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economic structures—researchers are challenged to ensure that findings are applicable across diverse populations and settings. Statistical analysis of heterogeneous samples requires large sample sizes, which are often difficult to achieve in rehabilitation settings.

Finally, as with all health research that aims to capture the full experience of health, functioning research that a 360-degree perspective faces considerable practical challenges. Investigating rehabilitation interventions can be resource-intensive, and economic constraints may limit the scope and scale of these studies, which in turn affects researchers' ability to address all aspects of functioning. It is also challenging to ensure that functioning research addresses issues that are aligned with individuals' priorities and values and to achieve meaningful patient participation in the research process. Disparities in access to rehabilitation services, particularly in underserved communities or low-income populations, pose challenges for study recruitment, may introduce selection bias, and compromise the external validity of studies. More generally, rehabilitation and healthy longevity research is underfunded, making it difficult to conduct high-quality research and to recruit and retain talented researchers. There is, as well, a need to train health scientists in functioning and to build academic capacity for a new generation of health researchers. Finally, functioning research results must be translated into practice and inform policy, which will require new strategies of implementation.

Objective of the Panel

The notion of functioning opens up the possibility for innovative research in health sciences, and rehabilitation and health longevity specifically, but capturing the full 360-degree view of the lived experience of health requires a range of scientific perspectives, including the biomedical, clinical, epidemiological, psychosocial, and socio-humanistic. The goals of this workshop is to explore this potential and opportunities of functioning-based health research and to identify key challenges in research on functioning for rehabilitation and healthy longevity.

Questions for Discussion

1) Does reorienting health sciences around the concept of functioning augment our understanding of the lived experience of health, and if so in which ways?
2) How can functioning as a framework for 360-degree research on the lived experience of health conditions be used fully in service of the scientific advancement of rehabilitation and the healthy longevity agenda?

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3) How can functioning within rehabilitation and healthy longevity research have maximum impact and recognition, given the need to emphasis multidisciplinary collaboration rather than prioritizing specific scientific disciplines or methodological approaches?
4) Do we need tailored scientific research careers in rehabilitation and healthy longevity to address challenges and enhance efforts to study functioning? What would ideal research curriculum look like in detail?
5) Are there unique and uniquely challenging issues in bridging the gap between functioning-based rehabilitation and healthy longevity research findings and practice and policy? Is novel translational research required to ensure that evidence-based interventions and policies are effectively implemented?

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—Drafted by Armin Gemperli

ADVOCACY FOR HEALTH AND SOCIAL POLICY IN SUPPORT OF HEALTHY LONGEVITY: FUNCTIONING AS THE THIRD INDICATOR OF HEALTH

Concept Note, Panel 5

Context

This panel will highlight the crucial role of advocacy in bringing awareness of the importance of the World Health Organization's concept of functioning from the International Classification of Functioning, Disability, and Health (ICF) as a fundamental pillar in reimagining health operationalization, and specifically the potential for rehabilitation being the health strategy of the twenty-first century.

Advocacy, at its heart, is the act of promoting and championing a particular cause or policy. In the realm of health and health care, advocacy

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takes on a pivotal role, serving as the bridge between innovative concepts and their acceptance in broader society.

The revolutionary concept of functioning in particular, while groundbreaking, is not immediately grasped or universally understood. The depth of its meaning, interlinking biological health factors with lived experiences, often clashes with prevalent, more monolithic interpretations of health. Addressing these misconceptions and the variety of interpretations requires targeted, informed advocacy.

Functioning melds the biological dimension of health with real-world lived experiences. These experiences, reflecting the dynamic between individual health states and their environment, shape our perceptions and understanding of health and what it means for us in our daily lives. Yet, this very depth and intricacy make it susceptible to misinterpretation or oversimplification. For functioning to truly reshape how we perceive health and rehabilitation, especially in the context of healthy longevity, strong advocacy initiatives are required to elucidate its nuances and significance.

Introducing functioning as the third health indicator, augmenting traditional indicators of mortality and morbidity, demands a shift in societal perspective, especially as the world contends with challenges like an aging population and the rise of noncommunicable diseases. These challenges underscore the need not just for quantitative longevity but also ensuring quality and purpose in those added years. Advocacy, then, becomes the key to stressing this nuance and urging the health care system to reorient its priorities toward optimizing functioning and recognizing the central role of rehabilitation.

In this light, the concept of functioning not only transforms our understanding of health but also refines our perspective on disability, framing it as a decrement in functioning. However, for this concept to take root, and to influence policies and public opinion, focused advocacy efforts are essential.

This panel seeks to emphasize the paramount importance of advocacy in solidifying the place of functioning within our health care discourse. It will explore the challenges and strategies in promoting this nuanced concept, and how, through informed and evidence-based advocacy, we can pave the way for a more comprehensive and effective approach to rehabilitation.

Objective of the Panel

The objective of this panel is to highlight the vital role of advocacy in advancing the understanding and integration of the World Health Organization's functioning concept within the broader health care and societal

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discourse, thereby paving the way for a central role of rehabilitation in health systems.

A. Awareness and clarification: to illuminate the depth and intricacies of the functioning concept, identifying what is difficult to communicate about it.
B. Strategizing advocacy: to discuss effective advocacy strategies that can resonate with diverse stakeholders—from health care professionals and policymakers to the general public.
C. Case studies and challenges: To share instances where advocacy for functioning faced hurdles, providing insights on overcoming these barriers and the lessons learned from these experiences.
D. Interdisciplinary collaboration: to underscore the importance of multidisciplinary collaboration in advocacy, bringing together voices from health care, policy, academia, and patient advocacy to create a unified and compelling narrative.
E. Futurescape: to envision the potential impact on health care and society should the advocacy for functioning succeed, emphasizing the transformations in policy, practice, and public perception.

Questions for Discussion

1) What are the most common misconceptions and challenges in communicating and speaking about functioning, and how can we more effectively explain its depth and nuances to varied audiences?
2) What best practices or innovative approaches can be adopted to ensure that advocacy strategies for the concept of functioning to resonate not only with medical professionals but also with policymakers and the general public?
3) How can we foster a more collaborative advocacy approach that integrates perspectives from health care, policy, academia, and patient advocacy to present a cohesive and impactful message about the concept of functioning?
4) Looking ahead, if our advocacy efforts concerning the concept of functioning are successful, what transformative changes can we anticipate in health care policies, practices, and public perceptions in the coming years?

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—Drafted by Sara Rubinelli

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Appendix D

Participant Biographical Sketches

Jonathan F. Bean, M.D., M.S., M.P.H., is a professor in the Department of Physical Medicine and Rehabilitation at Harvard Medical School. Bean is an internationally recognized expert in geriatric rehabilitation. The goal of his work is to foster the development of new models of care that optimize the functioning of older adults. This includes an emphasis on principles that are prioritized within age-friendly health care systems. These overarching goals are addressed through his leadership of the based New England Geriatric Research, Education and Clinical Center (GRECC), one of the 20 congressionally mandated VA GRECCS. Bean is the first physiatrist to ever lead a VA GRECC. He is also a staff physician at Spaulding Rehabilitation Hospital. His own research program focuses on developing new models of care that position rehabilitation as the center piece of secondary prevention of functional decline and adverse health outcomes among older adults. He leads a strong federally funded (NIH and VA) research training program for trainees of all levels desiring to pursue a career in patient-oriented research.

John Beard, Ph.D., M.B.B.S., is Irene Diamond Professor and director of the International Longevity Center USA at Columbia University, New York. He was previously director of ageing and life course with WHO in Geneva. While at WHO he led multiple large international initiatives including the 2015 *World Report on Ageing and Health*, the Integrated Care for Older People program, and the *Global Network of Age-Friendly Cities and Communities*, which now covers more than 300 million people. He has worked extensively with the World Economic Forum and was a commissioner with the recent U.S. National Academy of Medicine Commission on Healthy Longevity.

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Jerome Bickenbach, Ph.D., LL.B., is a permanent visiting professor at the Faculty of Health Sciences and Medicine at the University of Lucerne and professor emeritus in the Department of Philosophy and Faculties of Law and Medicine at Queen's University. Since 1995 he has been a consultant with the WHO working on the revision of the International Classification of Impairments, Disabilities, and Handicaps to the final draft leading to the ICF. Bickenbach has participated in nearly all revision activities and continues to consult with WHO on ICF dissemination and international disability social policy. His research is in disability studies, using qualitative and quantitative research techniques within the paradigm of participatory action research. Most recently his research includes disability quality of life and the disability critique, disability epidemiology, universal design and inclusion, modeling disability statistics for population health surveys, the relationship between disability and well-being, disability and aging issues and the application of ICF to monitoring the implementation of the UN Convention on the Rights of Persons with Disabilities. As a lawyer, Bickenbach was a human rights litigator, specializing in antidiscrimination for persons with intellectual impairments and mental illness. Since 2007 he has led the Disability Policy Unit at Swiss Paraplegic Research in Nottwil. He is the author of *Physical Disability and Social Policy* (1993) and the coeditor of *Introduction to Disability* (1998), *Disability and Culture: Universalism and Diversity* (2000), *A Seat at the Table: Persons with Disabilities and Policy Making* (2001), *Quality of Life and Human Difference* (2003), and numerous articles and chapters in disability studies.

Dorothy Boggs, Ph.D., O.T.R./L., M.Sc.P.H., F.H.E.A., is a mixed methods researcher at the London School of Hygiene and Tropical Medicine (LSHTM) who works with the International Centre for Evidence on Disability. She is a U.S. occupational therapist who received her bachelors in occupational therapy at Boston University and both her master's in public health and her Ph.D. in clinical research at LSHTM. She worked for Humanity & Inclusionfor almost seven years before joining LSHTM as a researcher in 2016. Boggs's work focuses primarily on health, functioning, and disability metrics and measurement approaches and global access to rehabilitation and assistive technology. She has published more than 25 peer-reviewed publications, in addition to a variety of gray literature publications and international conference presentations. She has more than 15 years' experience in rehabilitation, disability, inclusion, and maternal, newborn, and child health in low- and middle-income countries.

Henri Bounameaux, M.D., is an honorary professor and emeritus dean of the Faculty of Medicine of the University of Geneva. He was active for 40 years at the University Hospitals of Geneva as chief of the Division of

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Angiology and Hemostasis, chair of the Department of Internal Medicine, and director of education and research. His research topics dealt with all aspects of venous thromboembolic disease, mainly pulmonary embolism. Since 2020 he is the President of the Swiss Academy of Medical Sciences.

Somnath Chatterji, M.D., worked with WHO for more than 20 years, most recently as the outgoing director of the department of Data and Analytics. He trained as a medical doctor and specialized in psychiatry. He has coordinated several large international projects, including the development of the International Classification of Functioning, Disability and Health, the revision of the International Classification of Diseases and Related Health Problems, the World Health Surveys, WHO's Study on Global Ageing and Adult Health, the World Mental Health surveys, and several other large international projects funded by the National Institute on Aging, the National Institute of Mental Health, National Institute of Alcohol and Alcoholism, National Institute of Drug Abuse, the European Commission, and other funding agencies. He has participated as a speaker at several National Academies of Sciences meetings on subjective well-being, aging, and healthy longevity. He has a published track record of estimating the impact of health conditions and their burden globally, including books on the burden of mental disorders and on the cross-cultural study of disability. He has been listed by the Web of Science as being among the world's most cited researchers (h-index 102) and has more than 200 publications in prestigious peer-reviewed journals.

Alarcos Cieza, Ph.D., M.P.H., M.Sc., is head of the Integrated Service Delivery Unit and the Sensory Functions, Disability and Rehabilitation Unit at the WHO Department of Noncommunicable Diseases. In this role, she provides strategic leadership, management support and overall direction to WHO's work on integrated service delivery with a focus on noncommunicable diseases, eye and hearing care, rehabilitation, and disability. Before joining WHO in September 2014, she served as chair and professor of medical psychology at the Faculty of Social and Human Sciences at the University of Southampton in the United Kingdom and led a research unit for more than 10 years at the Department of Physical Medicine and Rehabilitation and then at the Pettenkofer School of Public Health at Ludwig-Maximilians-University, Munich, Germany.

Nicola Diviani, Ph.D., serves as a senior research associate at Swiss Paraplegic Research within the Person-Centered Health Care and Health Communication Group. He is also a lecturer at the University of Lucerne's Faculty of Health Sciences and Medicine. He is leading a pivotal four-year project focusing on the existential aspects of self-management for individuals

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recently diagnosed with spinal cord injuries, generously supported by the Swiss National Science Foundation. His involvement extends to numerous projects exploring health behavior and related factors. Diviani is an active member of the University of Lucerne's Center for Rehabilitation in Global Health Systems and has offered his expertise as a consultant to the World Health Organization's Make Listening Safe program and the World Rehabilitation Alliance. Furthermore, from 2016 to 2022 he represented Switzerland on the advisory committee of the International Association for Communication in Healthcare. Holding a PhD in communication sciences from the University of Lugano, Diviani's research primarily explores health behavior, literacy, self-management, health information seeking (both online and offline), health empowerment, eHealth, and mHealth. His work critically examines the challenges individuals face in leveraging new communication technologies for health-related purposes, such as cancer prevention, vaccination, or self-management, aiming to identify effective solutions to these issues. Over the years, Diviani has conducted extensive research at the Institute of Communication and Health at the University of Lugano, as well as at the Harvard School of Public Health and the Amsterdam School of Communication Research, contributing significantly to the field.

Victor J. Dzau, M.D., is president of the U.S. National Academy of Medicine and serves as vice chair of the U.S. National Research Council. He is chancellor emeritus and James B. Duke Professor at Duke University and past CEO of the Duke Health System. Previously, he was professor and chair of medicine at Harvard and Stanford Universities. He is an internationally acclaimed leader and physician-scientist whose research laid the foundation for development of the class of lifesaving drugs known as ACE inhibitors, used globally to treat high blood pressure and congestive heart failure. Dzau serves as the inaugural president of the NAM, where he leads a strategy of innovation, action, and equity. The launch of the NAM Healthy Longevity Global Grand Challenge represents Dzau's vision to inspire across disciplines and sectors to coalesce around a shared priority and audacious goal to advance health. The Grand Challenge consists of the *Global Roadmap for Healthy Longevity* and the Global Competition. Among Dzau's many honors and recognitions are the Gustav Nylin Medal from the Swedish Royal College of Medicine and the Poulzer Prize of the European Academy of Sciences and Arts. He is a member of the American Academy of Arts and Sciences, the Royal Society of Medicine, and the European Academy of Sciences and Arts. Dzau has received 18 honorary doctorates.

Julia Patrick Engkasan, Ph.D., M.B.B.S., is an associate professor at the Department of Rehabilitation Medicine, Universiti Malaya. Her primary

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research area is in spinal cord injury rehabilitation, but she is also leading research in pulmonary and geriatric rehabilitation. She has performed collaborative research within different disciplines in Universiti Malaya, Malaysia, and internationally. She is the chair of International Society of Physical and Rehabilitation Medicine–WHO Subcommittee and is a committee member of the International Classification of Functioning, Disability and Health Taskforce. She sits on the editorial boards of *Spinal Cord* journal, *Journal of Rehabilitation Medicine*, and *ASEAN Journal of Rehabilitation Medicine*. She graduated from the Universiti Malaya with a master's of rehabilitation medicine degree in 2006 and with a Ph.D. in shared decision making in 2017.

Walter R. Frontera, M.D., Ph.D., F.R.C.P., is a professor of physical medicine and rehabilitation at the University of Puerto Rico School of Medicine. He formerly served as the inaugural chair and professor of physical medicine and rehabilitation at Harvard Medical School and Vanderbilt University School of Medicine. Frontera's main research interest is study of the mechanisms underlying muscle atrophy and weakness in older people and the development of rehabilitative interventions for sarcopenia. He is editor in chief of the *American Journal of Physical Medicine and Rehabilitation* and the immediate past president of the International Society of Physical and Rehabilitation Medicine. He received his medical degree from the University of Puerto Rico School of Medicine and a Ph.D. in applied anatomy and physiology from Boston University. Frontera is a member of the National Academy of Medicine and has served on numerous National Academies' committees, including the Standing Committee of Medical and Vocational Experts for the Social Security Administration's Disability Programs and the Committee on the Use of Selected Assistive Products and Technologies in Eliminating or Reducing the Effects of Impairments. He is also a fellow of the Royal College of Physicians (London).

Francesca Gimigliano, M.D., Ph.D., is professor of physical and rehabilitation medicine, chair of the Clinical Unit of General and Specialist Rehabilitation Medicine, coordinator of the PhD National Program in Public Administration and Innovation for Disability and Social Inclusion, and president of the Bachelor Program of Speech and Language Therapy in the Department of Mental and Physical Health and Preventive Medicine at the University of Campania "Luigi Vanvitelli." Gimigliano is also the president of the International Society of Physical and Rehabilitation Medicine.

Marija Glisic, M.D., Ph.D., P.D., is a medical doctor with a master's degree in health sciences and a PhD in clinical epidemiology from Erasmus University Rotterdam Medical Center, the Netherlands. She has completed

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a postdoctoral qualification (habilitation) in clinical epidemiology at the University of Bern, Switzerland. Glisic is leading a research group at the Institute for Social and Preventative Medicine, University of Bern, that focuses on cardiometabolic disease and spinal cord injury. She also works at the Swiss Paraplegic Research in Campus Nottwil, Switzerland, where she co-leads the Cardiometabolic and Respiratory Research group. Glisic's research aims to understand the determinants of cardiometabolic disease risk in individuals with neurotrauma. Additionally, she seeks to support the development and implementation of cost-effective personalized interventions to reduce disease burden and improve the lived experience of people with injuries. Her research has a special focus on sex/gender differences, women's health, and lifestyle.

Abderrazak Hajjioui, M.D., M.P.M., Ph.D., has specialized in physical and rehabilitation medicine since 2009 and in pain medicine since 2011. Currently serving as a full professor at the Faculty of Medicine and Pharmacy, University Abdelmalek Essaâdi of Tangier, Morocco, he holds a European master's degree in physical and rehabilitation medicine and earned a master's degree in public management in 2014. In 2017 he was awarded the national prize for research and innovation in disability. His extensive contributions include the publication of numerous articles and books. As an international expert in rehabilitation in health systems, he serves as the cochair of the workforce workstream of the World Rehabilitation Alliance and is a member of the International Society of Physical and Rehabilitation Medicine ClinFIT Committee and the Task Force on Physical Activity for People with Disabilities, and the International Society of Physical and Rehabilitation Medicine–WHO Liaison Committee. Additionally, he is president of the Moroccan Association for the Promotion of Rehabilitation Sciences and Prevention of Disability, vice president of the Middle Eastern and North African network, and a member of the African SCI Network.

Alan M. Jette, Ph.D., is emeritus professor and dean at Boston University's Sargent College of Health and Rehabilitation Sciences and served as professor of health policy and management at the Boston University School of Public Health from 2005 to 2017. He also served as professor of rehabilitation sciences at the Massachusetts General Hospital Institute of Health Professions from 2012 to 2021. He is an international expert on rehabilitation and a leader in developing patient-centered rehabilitation outcome measures in a range of challenging clinical areas such as work disability, post-acute care, spinal cord injury, and neurological, orthopedic, and geriatric conditions. He has authored more than 250 publications in the rehabilitation sciences field and served as a principal investigator for

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

numerous studies funded by the National Institutes for Health, the National Institute on Disability, Independent Living, and Rehabilitation Research, the Agency for Healthcare Quality and Research, and several foundations. He has served as a member of more than a dozen National Academy of Sciences, Engineering, and Medicine boards and committees. He chaired the Institute of Medicine committee that authored the 2007 report *The Future of Disability in America*. In addition to cochairing the Forum on Aging, Disability, and Independence, he was chair of the Committee on the Use of Selected Assistive Products and Technologies in Eliminating or Reducing the Effects of Impairments. He was elected to the National Academy of Medicine in 2013. He earned a bachelor's degree in physical therapy from the State University of New York at Buffalo and a master's degree and Ph.D. in public health from the University of Michigan.

Ruth Katz, M.Ed., is the incoming president and CEO of Association of Jewish Aging Services in late February 2024. From 2018 to 2024 she served as senior vice president for policy and advocacy at LeadingAge. Both the Association of Jewish Aging Services and LeadingAge are membership organizations of nonprofit providers of aging services across the continuum of care, including nursing homes, assisted living, home care, hospice, low-income senior housing, and independent living services. At LeadingAge she led the Public Policy and Advocacy team, developing, leading, and overseeing the successful execution of LeadingAge's public policy agenda, including legislation and regulation. Based on the board-approved public policy agenda and in collaboration with state partners, Katz oversaw the development of LeadingAge's public policy positions and employed strategies to advance its policy agenda through Congress and the executive branch. She ensured thoughtful analysis of policy options and direction and activated the membership to achieve the LeadingAge agenda through engagement and grassroots efforts. Katz is a principal spokesperson for the association's public policy positions and the primary representative of the policy agenda to other organizations and coalitions concerned with policy issues affecting LeadingAge membership. Before joining LeadingAge, Ruth was a longtime executive at the U.S. Department of Health and Human Services, with a focus on development and execution of policy research and analysis for programs in aging, long-term care and disability. Ruth built her career at the Health and Human Services office of the assistant secretary for planning and evaluation and the office of disability, aging and long-term care policy. In her dual roles as the associate deputy assistant secretary and director of the division of aging and disability, she led, directed, and coordinated policy and research regarding the Health and Human Services disability, aging, Medicare, and long-term care policy agenda.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

NiCole R. Keith, Ph.D., M.S., is dedicated to research and programming that increases physical activity participation, improves fitness, and positively influences health outcomes while addressing health equity. She has served on the Indiana University Bloomington faculty since 2023. She also is a research scientist at the Center for Aging Research in the Indiana University School of Medicine and a Regenstrief Institute investigator. Keith was the 2020–2021 American College of Sports Medicine vice president of membership, communication, education, and policy as well as its 2020–21 president, and she serves on several other national committees for the organization. A fellow of the National Academy of Kinesiology, Keith serves on the academy's Justice, Equity, Diversity, and Inclusion Presidential Committee, the membership committee, and the editorial board. She is currently the chair of the National Physical Activity Plan and serves on the Physical Activity Alliance Advisory Committee. Keith earned a B.S. degree in physical education from Howard University in 1992, an M.S. degree in exercise science from the University of Rhode Island in 1994, a Ph.D. degree in exercise physiology from the University of Connecticut in 1999, and an M.S. degree in clinical research from Indiana University in 2011. She is trained in physical activity, community, and clinical research.

Fary Khan, M.D., A.M., M.B.B.S., F.A.F.R.M., is a specialist in rehabilitation and physical medicine and a fellow of the Royal Australasian College of Physicians. She is director of rehabilitation services at Royal Melbourne Hospital, clinical director at Australian Rehabilitation Research Centre, and clinical professor in the Department of Medicine at University of Melbourne, the Nossal Institute of Global Health, and the Peter MacCallum Cancer Centre. She is an elected international member for the U.S. National Academy of Medicine and was awarded the Member for the Order of Australia (2022) for her contribution to rehabilitation medicine and research. She is the inaugural academic fellow to the Royal Australasian College of Physicians' Board of the Australasian Faculty of Rehabilitation Medicine and elected board member of the Rehabilitation Medicine Society of Australia and New Zealand. She has 20 years of experience in neurological, cancer, and trauma rehabilitation. She set up evidence-based specialized rehabilitation programs for specific conditions such as multiple sclerosis, Guillain-Barre Syndrome, stroke, oncology, musculoskeletal injuries, and disaster management. She is chair of the Disaster Rehabilitation Committee, International Society of Physical and Rehabilitation Medicine, and Disaster Rehabilitation Special Interest Group, Rehabilitation Medicine Society of Australia and New Zealand. She holds more than 20 national and international executive positions and more than 15 international academic appointments at various universities. She is an executive member of International Society of Physical and Rehabilitation Medicine Women's Taskforce and Cancer Rehabilitation

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Working Group. She has an interest in refugee health and disability. She works with the executive for the UN International Council for Caring Communities and WHO–International Society of Physical and Rehabilitation Medicine Liaison Committee representing medical disability. She leads the Global Rehabilitation Flying Faculty (endorsed by the Australasian Faculty of Rehabilitation Medicine, Royal Australasian College of Physicians, and International Society of Physical and Rehabilitation Medicine), established to support capacity-building activities in Rehabilitation Medicine, with educational training programs in more than 15 countries. Khan has a leadership role in rehabilitative care in Australia with more than 20 years of experience in health outcomes and health services research. She has published more than 500 scientific papers in peer-reviewed academic journals (including 14 Cochrane reviews and 20 book chapters).

Matilde Leonardi, M.D., is the director of the Neurology, Public Health, and Disability Unit and Coma Research Centre, and is director Italian of the WHO Collaborating Centre Research Branch, Fondazione IRCCS Istituto Neurologico Carlo Besta, Milan, Italy. Leonardi is a neurologist, pediatrician, neonatologist, and child neurologist and specializes in bioethics. Leonardi is also a World Federation for NeuroRehabilitation Presidium member, Flying Faculty, and board member of advocacy; One Neurology ambassador; communication committee chair, board member, and FEAN Fellow of the European Academy of Neurology; European Federation Research in Rehabilitation board member; WHO expert on disability and neurology; cochair of the WHO NeuroCovid Forum essential neurological services group; and member of the Neuro Covid Global Research Coalition. Leonardi is a corresponding member of the Pontificia Academia Pro Vita and sits on the board of directors of the Bioethics Centdre at the Catholic University of Milan. Leonardi was nominated by Italian government to be a member of the National Bioethics Committee in 2022, was an elected board member of the National Neurology Society in October 2023, and was elected to the European Federation for Rehabilitation Research in November 2023.

Patricia Morsch, Ph.D., M.A., P.T., is a physical therapist and has more than 18 years of combined experience in clinical physical therapy and research on aging, older adults' health, and public health. She holds a graduate certificate in public health, a master of arts in gerontology from the University of North Carolina at Charlotte, and a PhD in biomedical gerontology from the Pontifical Catholic University of de Rio Grande do Sul, Brazil. Morsch works as the healthy aging advisor in the Department of Health Systems and Services at the Pan American Health Organization headquarters in the Washington, DC, regional WHO office for the Americas.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Elias Mpofu, Ph.D., D.Ed., is a professor of aging and rehabilitation sciences at the University of North Texas and honorary professor of health sciences at the University of Sydney. His aging and rehabilitation sciences research focuses on the development, implementation, and evaluation of resilience, social supports, and other health promotive relationships of older adults aging with or into disability. It frames aging and disability questions on the World Health Organization's International Classification of Disability, Health, and Functioning, an integrative approach for biological, psychological, and behavioral data. This provides for a holistic person–environment interaction perspective in which contextual factors are moderators between health and well-being components (body function and structure, activity limitations, and participation restrictions) and with feedback pathways among the components. His research advances the design of person-centric approaches for the successful community living and participation of older adults, supporting their empowered aging.

Diana Pacheco, Ph.D., is professor in the Faculty of Health Sciences and Medicine, University of Lucerne, and group leader of the Health Economics Group at Swiss Paraplegic Research. She earned a Ph.D. in economics from the University of Neuchatel, Switzerland, in 2013 and a M.Sc. in economics from the University of Lausanne, Switzerland, in 2008. Between 2015 and 2020, she was a postdoctoral fellow at Swiss Paraplegic Research in the Rehabilitation Services, Economics and Statistics Group. Since obtaining her Ph.D., Pacheco has taught several courses, including social policy, health systems and services, applied economics, and social impact of health. Her research interests include health economics, applied economics, and social policy.

Birgit Prodinger, Ph.D., M.Sc., M.Sc., is chair and professor of inclusive health care at the Faculty of Medicine at the University of Augsburg, Germany. Prodinger is a health and rehabilitation scientist with extensive experience in studying and teaching functioning. Her research focuses on describing and understanding the lived experience of people with disability and how health systems respond to their needs. By using the International Classification of Functioning, Disability and Health as a reference, she has contributed considerably to establishing methods for the standardized reporting of routinely collected functioning data in clinical practice. Prodinger is a member of the Centre for Rehabilitation in Global Health Systems, a Collaborating Centre of the WHO, at the University of Lucerne. Prodinger was trained as an occupational therapist in Salzburg, Austria, completed then the European master of science in occupational therapy program, a joint program of the Hogeschool van Amsterdam, Karolinska Institute, CVU Sud, and the University of Brighton. She completed her

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Ph.D. in health and rehabilitation sciences at Western University, Ontario, and received the Venia Legendi in Health Sciences from the University of Lucerne. Prodinger also holds a master of science in health informatics from University College London. Prodinger led a research group at Swiss Paraplegic Research focusing on describing and understanding the lived experience of health using the ICF as a reference system. Her research was conducted in close collaboration with the WHO, among other national and international stakeholders.

Jan D. Reinhardt, Ph.D., is an epidemiologist and rehabilitation researcher. He is currently employed as full professor and director of health sciences at the Institute for Disaster Management and Reconstruction of Sichuan University and Hong Kong Polytechnic University, China. In addition, Reinhardt is visiting professor at Jiangsu Province Hospital/Nanjing Medical University First Affiliated Hospital, China, and lecturing professor at the Department of Health Sciences and Medicine of the University of Lucerne, Switzerland. He is a Ph.D. supervisor at the West China School of Public Health and School of Nursing, Sichuan University, and at the Department of Health Sciences and Medicine, University of Lucerne. He is a former chair of the Disaster Rehabilitation Committee of the International Society of Physical and Rehabilitation Medicine and current chair of the Disaster Special Interest Group of the Asia-Oceania Society of Physical and Rehabilitation Medicine. Reinhardt is associate editor of the *International Journal of Public Health*. He has authored more than 150 original articles in international journals listed in science citation index with more than 3,700 citations and an h-index of 37. His research interests include rehabilitation research; International Classification of Functioning, Disability, and Health; epidemiology of functioning and disability; theory, measurement, and models of environmental factors and their relation to human health; labor market participation of persons with health conditions; effectiveness of clinical and health services interventions; international NGOs in disability and rehabilitation; health and rehabilitation after natural disaster; clinical trial design and research methodology; and prediction models for health care demand and payment.

Sara Rubinelli, Ph.D., holds a degree in classics and philosophy from the Catholic University of Milan and a Ph.D. from the University of Leeds in the areas of argumentation theory, persuasion, and rhetoric. She is professor in health communication at the Faculty of Health Sciences and Medicine of the University of Lucerne, and vice dean of health sciences. Since September 2009 she has led the Person-Centered Healthcare/Health Communication Group at Swiss Paraplegic Research. Since 2017 she has been a scientific advisor for the World Health Organization.

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

Carla Sabariego, Ph.D., M.P.H., is a clinical psychologist and holds a master's degree in public health and epidemiology from the Ludwig-Maximilians-Universität in Munich, Germany. She completed her Ph.D. in 2011 with a focus on cost-effectiveness evaluations of rehabilitation programs. Her habilitation, finished in 2016, focused on the implementation of the WHO ICF as a conceptual framework in clinical rehabilitation and public health. She pursued both her Ph.D. and habilitation at the Medical Faculty of Ludwig-Maximilians-Universität Munich, where she worked for 15 years as a senior researcher and lecturer at the Institute of Public Health and Health Services Research. From 2011 to 2018, she was a consultant to the WHO in the area of functioning and disability measurement; she mainly contributed to the development, pilot testing and implementation of the WHO Model Disability Survey—a dedicated functioning and disability survey—in several countries. From May 2017 to July 2018, she worked in the WHO's Disability and Rehabilitation Programme in the Department of Noncommunicable Diseases, Disability, Violence and Injury Prevention in Geneva. In January 2021 she was appointed assistant professor (tenure track) for rehabilitation and healthy aging at the Faculty of Health Sciences and Medicine, University of Lucerne, and is currently vice dean of the Department of Rehabilitation and Functioning Sciences. Together with Gerold Stucki, she heads the faculty's Centre for Rehabilitation in Global Health Systems, which has been a WHO Collaborating Centre since 2018. Through her bridge professorship, she leads the Ageing, Functioning Epidemiology and Implementation working group, together with Jerome Bickenbach, at Swiss Paraplegic Research in Nottwil.

Paola Sillitti, M.Sc., is a research officer in the Health Division at the Organization for Economic Co-operation and Development. Her work covers mainly the topics of end-of-life care, long-term care, and integrated care. She holds a master of science in economics and management and a bachelor of science in economics from Bocconi University, Milan. She has also studied economics at the Faculty of Business and Economics, University of Lausanne, and International Affairs at Sciences Po Paris.

Eleanor Simonsick, Ph.D., is an epidemiologist in the Longitudinal Studies Section of the Translational Gerontology Branch within the Intramural Research Program of the National Institute on Aging, where she serves as co-director of the Baltimore Longitudinal Study of Aging and Federal Project Officer of the Health, Aging and Body Composition study. For more than 35 years she has conducted aging-related research within the context of longitudinal observational studies focused on assessment of higher-order physical function and evaluating the behavioral, psychological, biomechani-

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Aging, Functioning, and Rehabilitation: Proceedings of a Workshop

cal, and physiologic factors and conditions that impact maintenance and decline in function and the overall aging process.

Bruno Staffelbach, Ph.D., is a professor for business administration, director of the Center for Human Resource Management, and president of the University of Lucerne. Staffelbach is an honorary member of the International Committee of the Red Cross and is a former brigadier general and commander of an infantry brigade of the Swiss Armed Forces.

Gerold Stucki, M.D., M.S., is a professor in the Faculty of Health Sciences and Medicine and director of the Center for Rehabilitation in Global Health Systems, a WHO Collaborating Center, at the University of Lucerne. He is also director of Swiss Paraplegic Research and the ICF Research Branch, Switzerland. A physician with clinical training in physical and rehabilitation medicine and rheumatology, Stucki holds a master of science in health policy and management from the Harvard School of Public Health and a diploma in biostatistics and epidemiology from McGill University, Montreal. He has been a member of the National Academy of Medicine since 2012.

Carl Willers, M.D., Ph.D., holds a Ph.D. in public health and epidemiology from Karolinska Institutet, where he is a postdoctoral researcher at the Department of Neurobiology, Care Sciences and Society. He is a member of a multidisciplinary research group focusing on rehabilitation, collaboration, and aging and has taught at various courses on the subjects of health equity and registry data studies. Ongoing research projects include health economic analysis of health care and social care for the Swedish geriatric population, evaluation of existing models for discharge from geriatric inpatient care, and development of new ways of working to optimize care transitions. He is employed as an intern physician at the Karolinska University hospital and is an affiliated researcher at the Research and Development Center for the Elderly, an initiative for enhancing operationalization of research for older adults, run by the Stockholm Region Council and its municipalities. He also holds a degree in economics from the Stockholm School of Economics and worked in management consultancy (McKinsey & Company) and health economics (i3, United Health Group) before entering academia.

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