Biomedicine & Prevention
An Open Access Transdisciplinary Journal

The Ageing Demographic and the Need for a New Prevention and Care Model

Liotta G.,[1] Capanna A.,[2] Gilardi F.,[1] Scarcella P.[1]

[1] Department of Biomedicine and Prevention; University of Rome "Tor Vergata"

[2] School of Specialisation in Hygiene and Medicine Prevention; University of Rome "Tor Vergata"

Edited by: L. Palombi, E. De Vito, G. Damiani, W. Ricciardi

The current ageing demographic is a challenge for European policies because of the associated increase in the requirement for health and social care services, which stresses healthcare systems. In this context, the concept of Active Ageing plays a key role in the political agenda, in terms of planning and implementing successful strategies to ensure the sustainability of health systems.[1,2] Active Ageing is "the process of optimising opportunities for health, lifelong learning, participation and security to enhance quality of life as people age",[3] and it reinforces positive aspects of ageing (i.e. environmental and behavioural factors).[2] In a historical period in which few health policies invest in prevention,[2] Active Ageing can be a driver for the implementation of health-promoting programmes. It is important to remember that successful strategies for Active Ageing are achieved through properly integrated policies (i.e. employment, health, social security, housing and social care).[4,5]

The health status of the population is the main determinant of the requirement for health and social care, but this is hard to define among individuals, populations, cultures, or even across time periods. Healthy Life Expectancy (HLE), which can be considered a proxy indicator for Active Ageing,[6] is an indicator that attempts to measure the health status of the elderly population in a country, and is related to a range of factors that also include prevention programmes. HLE is generally growing at a slower rate than Life Expectancy and decreased in some EU countries between 2010 and 2015.[6] This can be explained, firstly, by the fact that measurement of HLE is based on self-reported data, so it is affected by the subjective perception of the respondents as well as by their social and cultural background, while Life Expectancy is an objective parameter.[6] Other additional factors are also implicated, such as the approach to prevention and care in the older age groups: until now, the prevention and care model has been focused on a specific disease or on a group of diseases, such as prevention programmes for cervical cancer or for cardiovascular diseases.

Even if the approaches used by these programmes are very effective, as has also been shown by the results in terms of Life Expectancy, they sometimes fail to take into consideration citizens who suffer from different diseases at the same time and often show a decreased personal ability to follow medical prescriptions and/or a reduction in individual social capital that leaves them on their own coping with an increasing need for care. These people do not necessarily show a severe functional decline even in the presence of comorbidities, and need tailored intervention of prevention and care, based on an assessment of the risk of negative outcomes in the near future. This risk is determined not only by the diseases they suffer, but also by their functional status and by the availability of social and economic resources. Most older adults are affected by multimorbidity,[7] which entails patterns of progression of individuals towards psychological and physical dependency. In fact, the use of services, and primarily more expensive hospital services, is determined by an individual's functional decline and by psycho-social factors that increase the vulnerability of that individual to internal and environmental stressors more than by a specific disease or even by multimorbidity.[8] Bio-psychosocial factors should be managed in order to reduce the risk of negative outcomes like mortality, hospitalisation and institutionalisation. However, in order to manage this risk, it is crucial to measure it at community level, so as to detect different risk levels to be connected to personalised care interventions. The risk of negative outcomes associated with vulnerability could be defined as the frailty of an individual. Frailty is the combination of the individual's intrinsic capacity and the context of that individual's life, such as social relationships, household income and living arrangements. Frailty is associated with a higher incidence of multimorbidity, a different level of disability, reduced quality of life and increased healthcare service utilisation. Over the last decade, a view of frailty in older adults has been emerging, and is increasing on the basis of the bio-psychosocial paradigm developed in accordance with the WHO theory of health determinants.[9] This recognises the multidimensional nature of aging and bases its main domains not only on the physical but also on psychological, social and economic factors.[10-13] Many authors underline the crucial role played by social factors, such as social isolation,[14] as well as physical, psychological and cognitive ones, in increasing vulnerability to stressors, which is an expression of frailty. From a public health point of view, the multidimensional approach to frailty makes it possible to stratify the risk of negative events in sub-populations that do not yet show functional decline. The impact of social and economic determinants on health is a framework of historical significance for global public health and informs policies for supporting population health.[15] For a multi-domain assessment, public health should focus on frailty.[16] The first step in this process should then be an assessment of frailty, which could be administered as screening offered to all older adults (more likely to all citizens from 75 years of age), with very short, validated questionnaires designed for this purpose.

The Concept of Frailty

Putting frailty as the focus of the assessment of care needs would require a consensus definition of the concept, which we do not yet have.[17-19] Frailty in community-dwelling older adults should be defined as a risk factor for functional decline, death, hospitalisation, decline of quality of life and/or institutionalisation.[20-26] It is a multidimensional situation that involves the interactions of physical, psychological, environmental and socioeconomic factors: [18,27-31] older people perceive frailty as not only a physical issue, but also a social, psychological and environmental problem.[32] Many factors play an important role in the development and progression of the frailty. Among the risk factors are the level of disability and the presence and type of cohabitants, while protective factors include "living with a spouse" and "having a high educational level".[33] Evaluations of all factors that cause frailty are essential for identifying the older population at risk for adverse outcomes (i.e. functional decline, death, hospitalisation) and for designing a prevention programme.

While in the past, researchers analysed the biological framework and its determinants, several studies are now focused on psychological and socioeconomic domains that determine and influence frailty.[20-26,34] The assessment of non-biological frailty may play a crucial role in evaluating the burden of home care needs and in planning public health interventions. In fact, a lack of social and/or economic resources leads to increased use of acute care or long-term care services, even if the individual has minimal functional impairment.[35,36] It is well established that the risk of death is associated with social isolation and that a strong social network has a protective effect.[14]

Frailty is a dynamic condition and three phases can be recognised: no-frailty, pre-frailty and frailty. Pre-frailty is an intermediate phase that frequently forms part of the progression from no-frailty to frailty. To date, the process and the associated factors that determine the progression to and from no-frailty, pre-frailty and frailty have not been totally understood. The literature has highlighted some factors predisposing to progression of frailty, such as age, baseline condition, male sex, educational level, and the presence of specific illness (e.g. dementia, stroke, diabetes mellitus).[37-40] Even in this case, the factors assessed most often have been psychophysical ones.

Frailty can affect everyone during all stages of life, and has a prevalence rate ranging from 4% to 59.1% of the population. Nevertheless, the main age group affected is older adults: an average 10.7% of community-dwelling people aged more than 65 years are frail, with this percentage increasing to 15.7% and 26.1% for the 80-84 age group and the over-85 age group respectively.[41]

Comprehensive frailty assessment facilitates the planning of health and social care services, both at an individual and population level.[42,43] The debate on the appropriateness of tools developed for frailty screening is still ongoing,[44,45] and there is insufficient evidence for screening, monitoring or surveillance programmes at population level: a recent umbrella review did not find any short multidimensional screening tools suitable for use by public health practitioners at population level.[46] Even though assessment of frailty is not yet a common step for accessing appropriate care pathways, some European Union (EU) countries have developed integrated models of frailty assessment and good practices to address the management of chronic diseases, which have been implemented locally or regionally in several member states.[47-51]

The prevention of frailty at community level, or the delay in its onset/progression, is potentially associated with an improvement in the quality of life of citizens, which could translate into an increase in HLE and a reduction in the use of health care services. This would result in an improvement in the sustainability of the health system in the medium-long term. Some evidence is already available about the benefits of this approach.[47-52]

A new public health approach is therefore required that is able to offer appropriate care to frail older patients through the various stages and severity levels of disease, as well as guided access to frailty prevention programmes for robust citizens in order to postpone the onset of frailty as long as possible. A proactive model focused on frailty assessment[39] could become an entry point for patients and healthcare professionals in accessing integrated care, while the integrated management of chronic disease and frailty prevention programmes could offer appropriate tailored care pathways for each patient.[53,54]

Interventions to mitigate frailty and its consequences

In order to prevent the onset of frailty, interventions or programmes should be planned for managing co-morbidities, cognitive and functional impairment, and caregiver and social networks, and for promoting physical activity. In the context of the A3 Action Group-European Innovation Partnership on Active and Healthy Ageing, several intervention programmes have been implemented in order to prevent social isolation, physical decline, malnutrition and adverse drug reactions.[16]

An Italian program entitled "Long Live the Elderly!" (LLE) is aimed at increasing social networks and encouraging access to health and social services. This programme was able to limit increased mortality during the 2015 heatwave, with a reduction in expected mortality of 13%,[55] and reduced the hospital admission rate by approximately 10%.[56]

Two interventions have been designed for the screening and the prevention of malnutrition: the Prevention of Malnutrition in Senior Subjects project, which aims to prevent protein energy malnutrition in older populations by administering a protein screener questionnaire,[57] and the "NutriLive" project, which aims to improve knowledge of professionals about the nutritional needs of older adults.[58]

Physical activity is the main aim of two intervention projects: one project is a multi-component community-based exercise intervention that aims to improve gait patterns, balance and functional fitness,[59] which has resulted in an improvement in physical performance of subjects observed up to 18 months after intervention. Positive results in the management of frailty have also been achieved by preventive home visits or multi-professional senior group meetings on the progression of frailty.[60] Favourable effects on frailty indicators have also been observed using nutritional supplementation, cognitive training and combined multi-component interventions, e.g. combining physical exercise with nutritional supplementation.[61]

The Frailty, Falls and Functional Loss Education programme is an online course intended to improve knowledge about the ageing process, falls and functional decline, to promote independent living, and to provide strategies to promote active ageing and maintain independent living.[62]

In relation to medication, an Italian research group has developed a computerised prescription support system to manage polypharmacy and adverse drug reactions.[63]

Multi-factorial intervention programmes that include physical activity, nutrition and medication are effective, as demonstrated by one randomised, controlled trial. For this reason, the Personalised ICT Supported Service for Independent Living and Active Ageing project was developed. This project involves health pro-

motion and education interventions to improve self-management programmes for physical activity, cognition and nutrition.[64,65]

Conclusion

Further studies need to investigate the implementation of frailty models within a limited geographical area of a health service organisation context (i.e. health house, health district) in order to evaluate the organisation of a service network based on the frailty approach as a comprehensive method of addressing chronic diseases and health and social needs and preventing health inequalities. This frailty-based approach to ageing and non-communicable diseases could represent the criterion for access to social and health services, within a model that combines primary, secondary and tertiary prevention. Its implementation is favourably influenced by a proactive contact modality that reverses the current paradigm in which services respond to welfare requests without having a clear overall welfare demand in relation to the reference population.

References

1. Illario M, De Luca V, Tramontano G, Menditto E, Iaccarino G, Bertorello L, Palummeri E, Romano V, Moda G, Maggio M, Barbolini M, Leonardini L, Addis A. Italian EIP-AHA Working Group. The Italian Reference Sites of the European Innovation Partnership on Active and Healthy Ageing: Progetto Mattone Internazionale as an Enabling Factor. Ann Ist Super Sanita. 2017 Jan-Mar; 53 (1):60-69.
2. Domagała A, Arsenijevic J, Poscia A. Good Practices in Health Promotion for Older People. In Health Promotion for Older People in Europe. Scholar Publishing House Ltd. Warsaw 2017 – pp 147-178. ISBN 978-83-7383-906-9 doi 10.7366/9788373839069.
3. International Longevity Centre. Active Ageing: A Policy Framework in Response to Longevity Revolution. Available at: http://ilcbrazil.org/portugues/wp-content/uploads/sites/4/2015/12/Active-Ageing-A-Policy-Framework-ILC-Brazil_web.pdf.
4. Illario M, Vollenbroek-Hutten M, Molloy DW, Menditto E, Iaccarino G, Eklund P. Active and Healthy Ageing and Independent Living. J Aging Res 2015; 2015:542183.
5. García-Esquinas E, Rodríguez-Artalejo F. Environmental Pollutants, Limitations in Physical Functioning, and Frailty in Older Adults. Curr Environ Health Rep. 2017 Mar; 4 (1): 12-20.
6. Eurostat – Statistics Explained. Healthy Life Years Statistics. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthy_life_years_statistics.
7. Olaya B, Moneta MV, Caballero FF, Tyrovolas S, Bayes I, Ayuso-Mateos JL et al. Latent Class Analysis of Multimorbidity Patterns and Associated Outcomes in Spanish Older Adults: A Prospective Cohort Study. BMC Geriatr 2017; 17: 186.
8. Gilardi F, Scarcella P, Proietti MG, Capobianco G, Rocco G, Capanna A et al. Frailty as a Predictor of Mortality and Hospital Services Use in Older Adults: A Cluster Analysis in a Cohort Study. Eur J Public Health 2018. doi: 10.1093/eurpub/cky006.
9. Dahlgren G, Whitehead M. 1991. Policies and Strategies to Promote Social Equity in Health. Stockholm, Sweden: Institute for Futures Studies.
10. Gobbens RJ, van Assen MA, Luijkx KG, Wijnen-Sponselee MT, Schols JM. Determinants of Frailty. J Am Med Dir Assoc 2010; 11 (5): 356-64.
11. Gobbens RJ, Luijkx KG, Wijnen-Sponselee MT, Schols JM. Towards an Integral Conceptual Model of Frailty. J Nutr Health Aging 2010; 14 (3): 175-81.
12. de Vries NM, Staal JB, van Ravensberg CD, Hobbelen JS, OldeRikkert MG, Nijhuis-van der Sanden MW. Outcome Instruments to Measure Frailty: A Systematic Review. Ageing Res Rev 2011; 10 (1): 104-14.
13. Levers MJ, Estabrooks CA, Ross Kerr JC. Factors Contributing to Frailty: Literature Review. J Adv Nurs. 2006 Nov; 56 (3): 282-91.
14. Steptoe A, Shankar A, Demakakos P, Wardle J. Social Isolation, Loneliness, and All-Cause Mortality in Older Men and Women. Proc, Natl, Acad, Sci USA. 2013 Apr 9; 110 (15): 5797-801. doi: 10.1073/pnas.1219686110. Epub 2013 Mar 25.
15. Marmot M, Allen J, Bell R, Bloomer E, Goldblatt P; Consortium for the European Review of Social Determinants of Health and the Health Divide. WHO European Review of Social Determinants of Health and the Health Divide. Lancet. 2012 Sep 15; 380 (9846): 1011-29. doi: 10.1016/S0140-6736(12)61228-8.
16. Cano A, Dargent G, Carriazo A, López-Samaniego L, Apóstolo J, Campos E et al. Tackling Frailty and Functional Decline: Background of the Action Group A3 of the European Innovation Partnership for Active and Healthy Ageing. Maturitas 2018, 115: 69-73.
17. Zachary J. Palace, Flood-Sukhdeo J, MS, RD, CDN. The Frailty Syndrome. Today's Geriatric Medicine, Vol. 7 No. 1 P. 18.
18. Li Xue Q. The Frailty Syndrome: Definition and Natural History. Clin Geriatr Med. 2011 Feb; 27 (1): 1–15.
19. Buckinx F, Rolland Y, Reginster JY, Ricour C, Petermans J, Bruyère O. Burden of Frailty in the Elderly Population: Perspectives for a Public Health Challenge. Arch Public Health. 2015 Apr 10; 73 (1): 19.
20. Alvarado BE, Zunzunegui MV, Béland F, Bamvita JM. Life Course Social and Health Conditions Linked to Frailty in Latin American Older Men and Women. J Gerontol A Biol Sci Med Sci. 2008 Dec; 63 (12): 1399-406.
21. Gutiérrez-Robledo LM, Avila-Funes JA. How to Include the Social Factor for Determining Frailty? J Frailty Aging. 2012; 1 (1): 13-7.
22. Lang IA, Hubbard RE, Andrew MK, Llewellyn DJ, Melzer D, Rockwood K. Neighborhood Deprivation, Individual Socioeconomic Status, and Frailty in Older Adults. J Am Geriatr Soc. 2009 Oct; 57 (10): 1776-80.
23. Etman A, Kamphuis CB, van der Cammen TJ, Burdorf A, van Lenthe FJ. Do Lifestyle, Health and Social Participation Mediate Educational Inequalities in Frailty Worsening? Eur J Public Health. 2015 Apr; 25 (2): 345-50.
24. Szanton SL, Seplaki CL, Thorpe RJ Jr, Allen JK, Fried LP. Socioeconomic Status Is Associated with Frailty: The Women's Health and Aging Studies. J Epidemiol Community Health. 2010 Jan; 64 (1): 63-7.
25. Makizako H, Shimada H, Tsutsumimoto K, Lee S, Doi T, Nakakubo S, Hotta R, Suzuki T. Social Frailty in Community-Dwelling Older Adults as a Risk Factor for Disability. J Am Med Dir Assoc. 2015 Nov 1; 16 (11): 1003.e7-11.
26. Dent E, Hoogendijk EO. Psychosocial Factors Modify the Association of Frailty with Adverse Outcomes: A Prospective Study of Hospitalised Older People. BMC Geriatr. 2014 Sep 28; 14: 108.
27. Gerontopole Brussels Study Group. Frailty and the Prediction of Negative Health Outcomes: A Meta-Analysis. J Am Med Dir Assoc. 2016; 17 (12): 1163.e1-1163.e17.
28. Malaguarnera M, Vacante M, Frazzetto PM, Motta M. What Is Frailty in the Elderly? Value and Significance of Multidimensional Assessments. Arch Gerontol Geriatr. 2013; 56 (1): 23-6.
29. Abizanda P, Romero L, Sánchez-Jurado PM, Martínez-Reig M, Gómez-Arnedo L, Alfonso SA. Frailty and Mortality, Disability and Mobility Loss in a Spanish Cohort of Older Adults: the FRADEA Study. Maturitas. 2013 Jan; 74 (1): 54-60.
30. Fabrício-Wehbe SC, Rodrigues RA, Haas VJ, Fhon JR, Diniz MA. Association of Frailty in Hospitalized and Institutionalized Elderly in the Community-Dwelling. Rev Bras Enferm. 2016 Jul-Aug; 69 (4): 691-6.
31. Fried LP, Tangen CM, Walston J, Newman AB, Hirsh C, Gottdiener J, et al. Cardiovascular Health Study Collaborative Research Group: Frailty in Older Adults: Evidence for a Phenotype. The Journals of Gerontology, Series A, Biol Sci Med Sci 2001, 56A:M146-M156.
32. De Witte N, Gobbens R, De Donder L, Dury S, Buffel T, Schols J, Verté D. The Comprehensive Frailty Assessment Instrument: Development, Validity and Reliability. Geriatr Nurs. 2013 Jul-Aug; 34 (4): 274-81.
33. Liotta G, O'Caoimh R, Gilardi F, Proietti MG, Rocco G, Alvaro R, Scarcella P, Molloy DW, Orlando S, Mancinelli S, Palombi L, Stievano A, Marazzi MC. Assessment of Frailty in Community-Dwelling Older Adults Residents in the Lazio Region (Italy): A Model to Plan Regional Community-Based Services. Arch Gerontol Geriatr. 2017 Jan - Feb; 68: 1-7.
34. Andrew MK, Fisk JD, Rockwood K. Psychological Well-Being in Relation to Frailty: A Frailty Identity Crisis? Int Psychogeriatr. 2012 Aug; 24 (8): 1347-53.
35. Guerriero F, Orlando V, Tari DU, Di Giorgio A, Cittadini A, Trifirò G, Menditto E. How Healthy Is the Community-Dwelling Elderly Population? Results from Southern Italy. Transl Med UniSa. 2016 Jan 31; 13: 59-64.
36. Liotta G, Gilardi F, Scarcella P, Orlando S, Mancinelli S, Buonomo E, Marazzi MC, Palombi L. Trend and Determinants of Acute Inpatient Care for the Elderly in Italy from 2001 to 2011. Ann Ig 2016; 28 (5: September-October, in press).
37. Gill TM, Gahbauer EA, Allore HG, Han L. Transitions between Frailty States among Community-Living Older Persons. Arch Intern Med. 2006 Feb 27; 166 (4): 418-23.

38. Fallah N, Mitnitski A, Searle SD, Gahbauer EA, Gill TM, Rockwood K. Transitions in Frailty Status in Older Adults in Relation to Mobility: A Multistate Modelling Approach Employing a Deficit Count. J Am Geriatr Soc. 2011 Mar; 59 (3): 524-9.
39. Espinoza SE, Jung I, Hazuda H. Frailty Transitions in the San Antonio Longitudinal Study of Aging. J Am Geriatr Soc. 2012 Apr; 60 (4): 652-60.
40. Lee JS, Auyeung TW, Leung J, Kwok T, Woo J. Transitions in Frailty States among Community-Living Older Adults and Their Associated Factors. J Am Med Dir Assoc. 2014 Apr; 15 (4): 281-6.
41. Collard RM, Boter H, Schoevers RA, Oude Voshaar RC. Prevalence of Frailty in Community-Dwelling Older Persons: A Systematic Review. J Am Geriatr Soc. 2012 Aug; 60 (8): 1487-9212.
42. Ensrud KE, Ewing SK, Taylor BC, Fink HA, Cawthon PM, Stone KL, et al. Comparison of 2 Frailty Indexes for Prediction of Falls, Disability, Fractures, and Death in Older Women. Archives of Internal Medicine 2008 Feb 25, 168 (4): 382-9.
43. Beard JR, Bloom DE. Towards a Comprehensive Public Health Response to Population Ageing. Volume 385, No. 9968, p 658–661, 14 February 2015.
44. Gilardi F, Capanna A, Ferraro M, Scarcella P, Marazzi MC, Palombi L, Liotta G. Frailty Screening and Assessment Tools: A Review of Characteristics and Use in Public Health. Ann Ig. 2018 Mar-Apr; 30 (2): 128-139.
45. Rodríguez-Laso Á, O'Caoimh R, Galluzzo L, Carcaillon-Bentata L, Beltzer N, Macijauskienė J: Population Screening, Monitoring and Surveillance for Frailty: Three Systematic Reviews and a Grey Literature Review. Annali dell'Istituto Superiore di Sanità 2018, 54 (3): doi: 10.4415/ANN_18_03_12, in press.
46. Apóstolo J, Cooke R, Bobrowicz-Campos E, Santana S, Marcucci M, Cano A, Vollenbroek-Hutten M, Germini F, Holland C. Predicting Risk and Outcomes for Frail Older Adults: An Umbrella Review of Frailty Screening Tools. JBI Database System Rev Implement Rep. 2017 Apr; 15 (4): 1154-1208.
47. Marazzi, M.C. Inzerilli MC, Madaro O, Palombi L, Scarcella P, Orlando S, et al. Impact of the Community-Based Active Monitoring Program on Long Term Care Services Use and In-Patient Admissions of the Over-74 Population. Advances in Aging Research, 2015, 4, 187-194.
48. O'Caoimh R, Gao Y, Svendrovski A, Healy E, O'Connell E, O'Keeffe G, et al. Screening for Markers of Frailty and Perceived Risk of Adverse Outcomes Using the Risk Instrument for Screening in the Community (RISC). BMC Geriatr. 2014 Sep 19; 14: 104. doi: 10.1186/1471- 2318-14-104.
49. Van Velsen L, Illario M, Jansen-Kosterink S, Crola C, Di Somma C, Colao A, et al. J Aging Res. A Community-Based, Technology-Supported Health Service for Detecting and Preventing Frailty among Older Adults: A Participatory Design Development Process. J Aging Res. 2015; 2015:216084. doi: 10.1155/2015/216084. Epub 2015 Aug 5.
50. Romera L, Orfila F, Segura JM, Ramirez A, Möller M, Fabra ML, et al. Effectiveness of a Primary Care-Based Multifactorial Intervention to Improve Frailty Parameters in the Elderly: A Randomised Clinical Trial: Rationale and Study Design. BMC Geriatr. 2014 Nov 27; 14: 125.
51. O'Caoimh R, Gao Y, Svendrovski A, Healy E, O'Connell E, O'Keeffe G, et al. The Risk Instrument for Screening in the Community (RISC): A New Instrument for Predicting Risk of Adverse Outcomes in Community Dwelling Older Adults. BMC Geriatrics, 2015 Jul 30; 15: 92. doi: 10.1186/s12877-015-0095-z.
52. Orfila F, Romera L, Segura J. M., Ramırez A, Fabregat S, Moller M. Effectiveness of a Multifactorial Intervention to Modify Frailty Parameters in the Elderly. European General Practice Research Network (EGPRN), Eur. J. Gen. Pract. (2016) 1–8.
53. Stijnen M. Towards Proactive Care for Potentially Frail Older People in General Practice. Maastricht 2015. ISBN 978 94 6159 392 4.
54. Dubuc N, Bonin L, Tourigny A, Mathieu L, Couturier Y, Tousignant M, et al. Development of Integrated Care Pathways: Toward a Care Management System to Meet the Needs of Frail and Disabled Community-Dwelling Older People. Int J Integr Care. 2013 Apr-Jun; 13: e017.
55. Liotta G, Inzerilli MC, Palombi L, Madaro O, Orlando S, Scarcella P, Betti D, Marazzi MC. Social Interventions to Prevent Heat-Related Mortality in the Older Adult in Rome, Italy: A Quasi-Experimental Study. Int J Environ Res Public Health. 2018 Apr 11; 15 (4).
56. Liotta G, Inzerilli MC, Palombi L, Bianchini A, Di Gennaro L, Madaro O, Marazzi MC. Impact of Social Care on Hospital Admissions in a Sample of Community-Dwelling Older Adults: Results of a Quasi-Experimental Study. Ann Ig. 2018 Sep-Oct; 30 (5): 378-386.
57. PROMISS – Nutrition for Healthy Ageing. Available at: www.PROMISS-VU.eu.
58. Illario M, Maione AS, Rusciano MR et al. NutriLive: An Integrated Nutritional Approach as a Sustainable Tool to Prevent Malnutrition in Older People and Promote Active and Healthy Ageing – The EIP-AHA Nutrition Action Group. Advances in Public Health, 2016, Article ID 5678782.
59. Romera-Liebana L, Orfila F, Segura JM, Real J, Fabra ML, Möller M et al. Effects of a Primary-Care-Based Multifactorial Intervention on Physical and Cognitive Function in Frail, Elderly Individuals: A Randomized Controlled Trial. J Gerontol A Biol Sci Med Sci. 2018. doi: 10.1093/gerona/glx259.
60. Behm L, Eklund K, Wilhelmson K, Zidén L, Gustafsson S, Falk K et al. Health Promotion Can Postpone Frailty: Results from the RCT Elderly Persons in the Risk Zone. Public Health Nurs, 2016; 33: 303-315. doi: 10.1111/phn.12240.
61. Apóstolo J, Cooke R, Bobrowicz-Campos E, Santana S, Marcucci M, Cano A et al. Effectiveness of Interventions to Prevent Pre-Frailty and Frailty Progression in Older Adults: A Systematic Review. JBI Database System Rev Implement Rep. 2018; 16: 140-232. doi: 10.11124/JBISRIR-2017-003382.
62. Carnide F, Baptista F, Moura A, Jensen AM, Dias SB, Langberg H, Delpozo F (2017) Frailty, Falls, and Functional Loss Education: The 3Fights@Edu MOOC Perspective. *Journal of* BMC Sports Science, Medicine and Rehabilitation.
63. Arcopinto M, Cataldi M, De Luca V, Orlando V, Simeone G, D'Assante R, Postiglione A, Guida A, Trama U, Illario M, Ferrara N, Coscioni E, Iaccarino G, Cuccaro P, D'Onofrio G, Vigorito C, Cittadini A, Menditto E. Implementing an ICT-Based Polypharmacy Management Program in Italy. Transl Med UniSa. 2017 Jul 1; 16: 24-29.
64. Vuolo L, Barrea L, Savanelli MC, Savastano S, Rubino M, Scarano E, Soprano M, Illario M, Colao A, Di Somma C. Nutrition and Osteoporosis: Preliminary data of Campania Region of European PERsonalised ICT Supported Service for Independent Living and Active Ageing. Transl Med UniSa. 2016 Jan 31; 13: 13-8.
65. Barrea L, Muscogiuri G, Di Somma C, Tramontano G, De Luca V, Illario M, Colao A, Savastano S. Association between Mediterranean Diet and Hand Grip Strength in Older Adult Women. Clin Nutr. 2018 Apr 3. pii: S0261-5614(18)30124-9.